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LIST

THE

CONTRIBUTORS,

With References to the several Articles contributed by each.

Page

BAILY, JOSEPH S., F.L.S.

Descriptions of new South-American Coleoptera of the Genus *Diabrotica* 88

BARDELEBEN, Professor KARL.

On the Præpollex and Præhallux, with Observations on the Carpus of *Theriodesmus phylarchus*. (Plate XXX.) .. 259

BATES, H. W., F.R.S., F.Z.S., &c.

On new Species of the Coleopterous Family *Carabidæ*, collected by Mr. J. H. Leech in Kashmir and Baltistan.... 210

On new Species of the Coleopterous Families *Cicindelidæ* and *Carabidæ*, taken by Mr. Pratt in Chang Yang, near Ichang on the Yang-tsze, China 216

On new Genera and Species of Coleopterous Insects from Mount Kinibalu, North Borneo 383

BEDDARD, FRANK E., M.A., F.R.S.E., F.G.S., F.Z.S., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

Note upon the Green Cells in the Integument of *Æolosoma tenebrarum*. (Plate V.) 51

Page

On certain Points in the Anatomy of the Accipitres, with reference to the Affinities of *Polyboroides* 77

Some Notes upon the Anatomy of the American Tapir (*Tapirus terrestris*) 252

On the Oligochætous Fauna of New Zealand, with preliminary Descriptions of new Species 377

Contributions to the Natural History of an Annelid of the Genus *Dero* 440

Contributions to the Anatomy of Picarian Birds.—Part I. On some Points in the Structure of the Hornbills 587

On the Anatomy of Burmeister's Cariama (*Chunga burmeisteri*) 594

BEDDARD, FRANK E., M.A., Prosector to the Society, Lecturer in Biology at Guy's Hospital, and TREVES, FREDERICK, F.R.C.S., Surgeon to and Lecturer in Anatomy at the London Hospital.

On the Anatomy of *Rhinoceros sumatrensis*..... 7

BEDDOME, Col. R. H.

Descriptions of Land-Shells from the Island of Koror, Pelew Group. (Plates XI. & XII.) 112

BELL, F. JEFFREY, M.A., Sec.R.M.S., F.Z.S., Professor of Comparative Anatomy in King's College, London.

Remarks upon *Bipalium kewense* 5

Additions to the Echinoderm Fauna of the Bay of Bengal 6

Descriptions of some new or rare Species of Plexaurids. (Plate III.) 47

Exhibition of, and remarks upon, specimens of *Virgularia mirabilis*, *Palinurus vulgaris*, and *Galathea strigosa* 394

Page

BLAAUW, F. E. (of Amsterdam).

Letter from, containing remarks upon the Development of the Horns of the White-tailed Gnu (*Catoblepas gnu*) 2

BOULENGER, G. A., F.Z.S.

On the Species of *Rhacophorus* confounded under the name of *R. maculatus* 27

On some Specimens of Lizards in the Zoological Museum of Halle (Saale). (Plate XV.)..... 143

Second Account of the Fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat, East Coast of Arabia. (Plates XXV.–XXVIII.) 236

Note on *Python curtus*. (Plate XLV.) 432

BULLER, Sir WALTER, K.C.M.G., F.R.S., C.M.Z.S.

On a Species of Crested Penguin (*Eudyptes sclateri*) from the Auckland Islands. (Plate IX.)..... 82

BUTLER, ARTHUR G., F.L.S., F.Z.S., Assistant-Keeper, Zoological Department, British Museum (Nat. Hist.)

Description of a new Genus of Fossil Moths belonging to the Geometrid Family *Euschemidæ*. (Plate XXXI.)..... 292

BUTLER, GERARD W., B.A.

On the Subdivision of the Body-cavity in Lizards, Crocodiles, and Birds. (Plates XLVI.–XLIX.) 452

On the Relations of the Fat-bodies of the Sauropsida. (Plates LIX. & LX.) 602

CAMBRIDGE, Rev. O. PICKARD, M.A., F.R.S., C.M.Z.S., &c.

On some new Species and a new Genus of Araneidea. (Plate II.) 34

On a new Tree Trap-door Spider from Brazil 250

Page

On certain Points in the Anatomy of the Accipitres, with reference to the Affinities of *Polyboroides* 77

Some Notes upon the Anatomy of the American Tapir (*Tapirus terrestris*) 252

On the Oligochætous Fauna of New Zealand, with preliminary Descriptions of new Species 377

Contributions to the Natural History of an Annelid of the Genus *Dero* 440

Contributions to the Anatomy of Picarian Birds.—Part I. On some Points in the Structure of the Hornbills 587

On the Anatomy of Burmeister's Cariama (*Chunga burmeisteri*) 594

Beddard, Frank E., M.A., Prosector to the Society, Lecturer in Biology at Guy's Hospital, and Treves, Frederick, F.R.C.S., Surgeon to and Lecturer in Anatomy at the London Hospital.

On the Anatomy of *Rhinoceros sumatrensis*..... 7

Beddome, Col. R. H.

Descriptions of Land-Shells from the Island of Koror, Pelew Group. (Plates XI. & XII.) 112

Bell, F. Jeffrey, M.A., Sec.R.M.S., F.Z.S., Professor of Comparative Anatomy in King's College, London.

Remarks upon *Bipalium kewense* 5

Additions to the Echinoderm Fauna of the Bay of Bengal 6

Descriptions of some new or rare Species of Plexaurids. (Plate III.) 47

Exhibition of, and remarks upon, specimens of *Virgularia mirabilis*, *Palinurus vulgaris*, and *Galathea strigosa* 394

Page

BLAAUW, F. E. (of Amsterdam).

Letter from, containing remarks upon the Development of the Horns of the White-tailed Gnu (*Catoblepas gnu*) 2

BOULENGER, G. A., F.Z.S.

On the Species of *Rhacophorus* confounded under the name of *R. maculatus* 27

On some Specimens of Lizards in the Zoological Museum of Halle (Saale). (Plate XV.)..... 143

Second Account of the Fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat, East Coast of Arabia. (Plates XXV.–XXVIII.) 236

Note on *Python curtus*. (Plate XLV.) 432

BULLER, Sir WALTER, K.C.M.G., F.R.S., C.M.Z.S.

On a Species of Crested Penguin (*Eudyptes sclateri*) from the Auckland Islands. (Plate IX.)..... 82

BUTLER, ARTHUR G., F.L.S., F.Z.S., Assistant-Keeper, Zoological Department, British Museum (Nat. Hist.)

Description of a new Genus of Fossil Moths belonging to the Geometrid Family *Euschemidæ*. (Plate XXXI.)..... 292

BUTLER, GERARD W., B.A.

On the Subdivision of the Body-cavity in Lizards, Crocodiles, and Birds. (Plates XLVI.–XLIX.) 452

On the Relations of the Fat-bodies of the Sauropsida. (Plates LIX. & LX.) 602

CAMBRIDGE, Rev. O. PICKARD, M.A., F.R.S., C.M.Z.S., &c.

On some new Species and a new Genus of Araneidea. (Plate II.) 34

On a new Tree Trap-door Spider from Brazil 250

Page

COOKE, Rev. A. H., M.A., F.Z.S.

On the Generic Position of the so-called *Physæ* of Australia 136

DICKSON, Dr. E. D., C.M.Z.S. *See* SCLATER, P. L.

DRESSER, HENRY E., F.Z.S.

Exhibition of, and remarks upon, some eggs of the Adriatic Black-headed Gull and the Slender-billed Gull obtained in Andalusia 316

EVERETT, A. H., C.M.Z.S.

Remarks on the Zoo-geographical Relationships of the Island of Palawan and some adjacent Islands. (Plate XXIII.) 220

FISK, Rev. G. H. R., C.M.Z.S.

Extract from a letter containing remarks upon *Bipalium kewense* 586

FLOWER, WILLIAM HENRY, C.B., LL.D., F.R.S., F.L.S., President of the Society.

Exhibition of, and remarks upon, the skin of the face of a male African Rhinoceros with a third horn 448

GADOW, HANS, Ph.D., M.A., F.Z.S., Strickland Curator and Lecturer on the Advanced Morphology of Vertebrata in the University of Cambridge.

On the Taxonomic Value of the Intestinal Convolutions in Birds. (Plate XXXII.) 303

GIGLIOLI, HENRY H., C.M.Z.S.

On a supposed new Genus and Species of Pelagic Gadoid Fishes from the Mediterranean. (Plate XXXIV.) 328

GODWIN-AUSTEN, Lieut.-Col. H. H., F.R.S., F.Z.S., &c.

On a Collection of Land-Shells made in Borneo by Mr. A. Everett, with Descriptions of supposed new Species.—Part I. Cyclostomaceæ. (Plates XXXV.–XXXIX.) 332

Page

GOODWIN, A. P.

Exhibition of, and remarks upon, some rare Paradise-birds, procured during Sir William Macgregor's recent expedition to Mount Owen-Stanley, New Guinea 451

GORHAM, Rev. H. S., F.Z.S., F.E.S.

Descriptions of new Species and of a new Genus of Coleoptera of the Family *Telephoridæ*. (Plate X.) 96

Descriptions of new Species of the Coleopterous Family *Erotylidæ*. (Plate LXI.) 613

GREEN, J. F., F.Z.S.

Exhibition of a large example of the Common Eel (*Anguilla vulgaris*) 327

GÜNTHER, ALBERT C. L. G., M.A., M.D., F.R.S., V.P.Z.S., Keeper of the Zoological Department, British Museum.

Exhibition of, and remarks upon, some Fishes from the west coast of Scotland 27

Notice of two Fishes new to the British Fauna. (Plate IV.) 50

Exhibition of a monnted specimen of *Gazella thomsoni* .. 59

On some Fishes from the Kilima-njaro district. (Plate VIII.) 70

Description of a new Antelope from Southern Central Africa 73

Note on a Bornean Porcupine, *Trichys lipura* 75

GURNEY, JOHN HENRY, Jun., F.Z.S.

Exhibition of, and remarks upon, a specimen of a Hybrid Wagtail 394

HOWES, G. B., F.Z.S., F.L.S., Assistant Professor of Zoology, Normal School of Science and Royal School of Mines S. Kensington.

Exhibition of, and remarks upon, a specimen of the Mammary Region of a female of *Myrmecobius fasciatus*.... 85

Page

HOYLE, WILLIAM E., M.A. (Oxon.), F.R.S.E.

Observations on the Anatomy of a rare Cephalopod (*Gonatus fabricii*). (Plates XIII. & XIV.) 117

JACOBY, MARTIN, F.E.S.

List of the *Crioceridæ*, *Cryptocephalidæ*, *Chrysomelidæ*, and *Galerucidæ* collected in Venezuela by M. Simon, with Descriptions of the new Species..... 263

KIRBY, W. F., F.E.S., Assistant in the Zoological Department, British Museum.

Descriptions of new Genera and Species of Odonata in the Collection of the British Museum, chiefly from Africa .. 297

LEECH, J. H., B.A., F.R.G.S., F.L.S., F.Z.S., F.E.S., &c.

On the Lepidoptera of Japan and Corea.—Part III. Heterocera, Sect. II. *Noctues* and *Deltoides*. (Plates L.–LIII.) 474

LODER, Sir E. G., Bart., F.Z.S.

Exhibition of, and remarks upon, a mounted skeleton of a Rocky-Mountain Goat (*Haplocerus montanus*)..... 59

LYDEKKER, R., B.A., F.Z.S., F.G.S., &c.

On a Skull of the Chelonian Genus *Lytoloma*. (Plates VI. & VII.) 60

On an apparently new Species of *Hyracodontotherium*.... 67

On Associated Remains of a Theriodont Reptile from the Karoo System of the Cape. (Plates LIV. & LV.)..... 572

MINCHIN, EDWARD A., Keble College, Oxford.

Note on the Mode of Attachment of the Embryos to the Oral Arms of *Aurelia aurita*. (Plates LVII. & LVIII.) 583

MONTICELLI, FR. SAV.

Notes on some Entozoa in the Collection of the British Museum. (Plate XXXIII.)..... 321

Page

MUYBRIDGE, EADWEARD.

Exhibition of a number of projections with the Oxy-hydrogen Lantern to show the Locomotion of Animals 327

NEWTON, ALFRED, M.A., F.R.S., F.L.S., V.P.Z.S., Professor of Zoology and Comparative Anatomy in the University of Cambridge.

Exhibition of, and remarks upon, a specimen of the so-called *Pennula millsi* 5

On the Breeding of the Seriemá (*Cariama cristata*). (Plate I.) 25

NEWTON, E. T., F.G.S., F.Z.S.

A Contribution to the History of Eocene Siluroid Fishes. (Plate XXI.) 201

Exhibition of a tibio-tarsus of an extinct bird (*Gastornis klasseni*) from the Woolwich Beds of Croydon 220

OGILBY, J. DOUGLAS, F.L.S., Ichthyological Department, Australian Museum, Sydney.

Notes on some Fishes new to the Australian Fauna 151

PARKER, W. K., F.R.S., F.Z.S., &c.

On the Osteology of *Steatornis caripensis*. (Plates XVII.–XX.) 161

PARKER, W. NEWTON, Ph.D., F.Z.S., Professor of Biology in the University College of S. Wales and Monmouthshire.

On the occasional Persistence of the Left Posterior Cardinal Vein in the Frog, with Remarks on the Homologies of the Veins in the Dipnoi 145

ROBERTSON, DAVID, and STEBBING, Rev. THOMAS R. R., M.A.

Notice of a Memoir containing the descriptions of four new British Amphipodous Crustaceans 452

ROMANES, GEORGE J., F.R.S., F.Z.S.

On the Mental Faculties of the Bald Chimpanzee (*Anthropopithecus calvus*) 316

Page

SCLATER, PHILIP LUTLEY, M.A., Ph.D., F.R.S., Secretary to the Society.

Report on the additions to the Society's Menagerie in December 1888 1

Report on the additions to the Society's Menagerie in January 1889 26

Exhibition of, and remarks upon, a living specimen of the Thick-billed Lark (*Rhamphocorys clot-beyi*) 26

On some new Species and Genera of Birds of the Family *Dendrocolaptidæ* 32

Exhibition of, and remarks upon, a series of specimens of the eggs and chicks of the Hoatzin (*Opisthocomus cristatus*). 57

Exhibition of, and remarks upon, some heads and skins of a new Antelope obtained by Mr. H. C. V. Hunter, F.Z.S., in North-Eastern Africa 58

Report on the additions to the Society's Menagerie in February 1889 85

Remarks upon the Collections of Fishes made at Constantinople by Dr. E. D. Dickson, C.M.Z.S. 135

Report on the additions to the Society's Menagerie in March 1889 160

Exhibition of, and remarks upon, a pair of Buprestine Beetle (*Julodis ffinchi*), obtained by Mr. B. T. Ffinch near Karachi 219

Exhibition of, and remarks upon, a specimen of the Mole-cricket (*Gryllotalpa vulgaris*) found at Bagdad, and transmitted by Mrs. Talbot 219

Remarks on interesting animals observed during a visit to the Zoological Gardens of Rotterdam, Amsterdam, and Antwerp 219

Page

Report on the additions to the Society's Menagerie in April 1889 246

Exhibition of, and remarks upon, a living specimen of an albino variety of the Cape Mole-Rat 246

Exhibition of, and remarks upon, a mummy of a Falcon obtained at Thebes in Egypt 262

Exhibition of, and remarks upon, a series of photographs taken at Antipodes Island 262

Exhibition of, and remarks upon, a Leaf-insect (*Phyllium gelonus*) living in the Society's Insect-house 262

Report on the additions to the Society's Menagerie in May 1889 316

List of Birds collected by Mr. Ramage in Dominica, West Indies 326

Description of Hunter's Antelope. (Plate XLII.) 372

Report on the additions to the Society's Menagerie in June, July, August, and September, 1889 393

List of Birds collected by Mr. Ramage in St. Lucia, West Indies 394

Report on the additions to the Society's Menagerie in October 1889 447

Exhibition of a skin of an albino variety of the Cape Mole-Rat (*Georychus capensis*) 449

Report on the additions to the Society's Menagerie in November 1889 586

Exhibition of, and remarks upon, an egg of the Crested Screamer (*Chauna chavaria*) 586

Page

SEEBOHM, HENRY, F.L.S., F.Z.S., &c.

Exhibition of, and remarks upon, a male example of *Phasianus chrysomelas* purchased in Leadenhall Market..... 247

Exhibition of, and remarks upon, a small collection of Birds from the Bonin Islands, and of a pair of *Merula celænops* from Fatsirio Island 586

SHELLEY, Captain G. E., F.Z.S.

On the Birds collected by Mr. H. C. V. Hunter, F.Z.S., in Eastern Africa. (Plates XL. & XLI.) 356

SOWERBY, G. B., F.L.S., F.Z.S.

Descriptions of thirteen new Species of Land-Shells, with a Note on *Bulimus fulminans*. (Plate LVI.) 577

STEBBING, Rev. THOMAS R. R., M.A.

Notice of a Memoir on *Urothoë*, a Genus of Amphipodous Crustaceans, and on a new allied Genus, proposed to be called *Urothoides* 394

STEBBING, Rev. THOMAS R. R., M.A., and ROBERTSON, DAVID.

Notice of a Memoir containing the descriptions of four new British Amphipodous Crustaceans 452

STIRLING, E. C., M.A., M.D. Cantab., F.R.C.S. Eng., Lecturer on Physiology in the University of Adelaide.

Letter from, containing a Description of a new Australian Mammal..... 247

On some Points in the Anatomy of the Female Organs of Generation of the Kangaroo, especially in relation to the acts of Impregnation and Parturition 433

SWINHOE, Col.C., F.L.S., F.Z.S.

On New Indian Lepidoptera, chiefly Heterocera. (Plates XLIII. & XLIV.)..... 396

TACZANOWSKI, L., C.M.Z.S.

Description d'une nouvelle *Locustella* de la Corée 620

Page

TEGETMEIER, WILLIAM BERNHARD, F.Z.S.

Exhibition of, and remarks upon, a specimen of a female Gold Pheasant in male plumage 135

Exhibition of a pair of distorted Horns of the Ibex of Cashmere (*Capra sibirica*)..... 135

Exhibition of, and remarks upon, some specimens illustrative of the Variations of Plumage of the Common Partridge..... 394

THOMAS, OLDFIELD, F.Z.S., Natural-History Museum.

Exhibition of a new Species of Muntjac, from Tenasserim, proposed to be called *Cervulus fecæ* 85

Description of a new Bornean Monkey belonging to the Genus *Semnopithecus*. (Plate XVI.)..... 159

Preliminary Notes on the Characters and Synonymy of the different Species of Otter 190

On the Mammals of Mount Kina Balu, North Borneo. (Plate XXIV.) 228

Description of a new Genus of Muridæ allied to *Hydromys*. (Plate XXIX.) 247

On a new Mungoose allied to *Herpestes albicaudatus*. (Plate LXII.) 622

THOMSON, ARTHUR, Head-Keeper of the Society's Menagerie.

Report on the Insect-house for 1888 85

TREVES, FREDERICK, F.R.C.S., Surgeon to and Lecturer in Anatomy at the London Hospital, and BEDDARD, FRANK E., M.A., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

On the Anatomy of *Rhinoceros sumatrensis*..... 7

Page

TRISTRAM, Rev. HENRY BAKER, M.A., LL.D., F.R.S., Canon of Durham.

Remarks upon a specimen of *Emberiza cioides*, stated to have been captured at Flamborough, in the collection of Mr. Chase 6

WILSON, SCOTT, F.Z.S.

Descriptions of some new Species of Sandwich-Island Birds 445

WOODWARD, A. SMITH, F.G.S., F.Z.S., of the British Museum (Natural History).

Exhibition of, and remarks upon, a maxilla of *Saurichthys*, from the Rhætic Formation of Aust Cliff, near Bristol 161

Note on *Bucklandium diluvii*, König, a Siluroid Fish from the London Clay of Sheppey. (Plate XXII.)..... 208

Remarks upon an extinct Saw-fish (*Sclerorhynchus atavus*) and exhibition of a fragment of its rostrum..... 449

WOODWARD, B. B., British Museum (Nat. Hist.).

Exhibition of, and remarks upon, a drawing of a Carnivorous Snail, *Ærope caffra* 327

Exhibition of an example of a fossil Shell, *Neritina schmideliana*, and remarks upon its peculiar mode of growth 327

LIST OF PLATES.

1889.

Plate		Page
I.	Eggs of *Cariama cristata*	25
II.	New Spiders	34
III.	Spicules of Plexaurids	47
IV.	*Lichia vadigo*	50
V.	*Æolosoma tenebrarum*	51
VI. VII.	*Lytoloma crassicostatum*	60
VIII.	Fig. A. *Synodontis punctulatus*. Fig. B. *Tylognathus montanus*	70
IX.	Fig. 1. Head of *Eudyptes sclateri*. Fig. 2. Head of *Eudyptes pachyrhynchus*	82
X.	New Species of *Telephoridæ*	96
XI. XII.	New Land-Shells from Koror	112
XIII. XIV.	Anatomy of *Gonatus fabricii*	117
XV.	Fig. 1. *Gymnodactylus horridus*. Fig. 2. *Urostrophus scapulatus*	143
XVI.	*Semnopithecus hosei*	159
XVII. XVIII. XIX. XX.	Structure of *Steatornis*	161
XXI.	Siluroid Fishes	201
XXII.	*Bucklandium diluvii*	208
XXIII.	Map of Palawan and adjacent Islands	220
XXIV.	*Sciurus whiteheadi*	228
XXV.	*Tetraroge guentheri*	236
XXVI.	*Caranx jayakari*	
XXVII.	Fig. 1. *Trigla arabica*. Fig. 2. *T. polysticta*	
XXVIII.	*Monacanthus melanoproctes*	
XXIX.	*Xeromys myoides*	247
XXX.	Præpollex and præhallux of Mammals	259

Plate		Page
XXXI.	*Lithopsyche* and allied Genera	292
XXXII.	Diagrammatic representation of affinities of Birds according to their intestinal convolutions	303
XXXIII.	New or rare Entozoa	321
XXXIV.	*Eretmophorus kleinenbergi*	328
XXXV.–XXXIX.	New Bornean Land-Shells	332
XL.	*Pachyprora mixta*, ♂ et ♀	356
XLI.	Fig. 1. *Zosterops perspicillata*. Fig. 2. *Cinnyris hunteri*	
XLII.	*Damalis hunteri*, ♀	372
XLIII.–XLIV.	New Indian Lepidoptera	396
XLV.	*Python curtus*	432
XLVI.–XLIX.	Body-cavity in Lizards, &c.	452
L.–LIII.	Lepidoptera of Japan and Corea	474
LIV.	Theriodont Vertebræ	572
LV.	Theriodont Limb-bones	
LVI.	New Species of Land-Shells	577
LVII.–LVIII.	*Aurelia aurita*	583
LIX.–LX.	Fat-bodies in Sauropsida	602
LXI.	New Species of *Erotylidæ*	613
LXII.	*Herpestes grandis*	622

LIST OF WOODCUTS.

1889.

	Page
Horns of young *Catoblepas gnu*, 11 weeks old	2
Horns of *Catoblepas gnu*, 16 months old	3
Horns of *Catoblepas gnu*, 19 months old	3
Horns of *Catoblepas gnu*, adult female	4
Hard palate of *Rhinoceros sumatrensis*	8
Rhinoceros sumatrensis. Cartilages of nasal diverticulum, partly cut away to show interior of sac	11
Fore limb (inner side) of *Rhinoceros sumatrensis*	12
Fore limb (anterior surface) of *Rhinoceros sumatrensis*	13
Fore limb (posterior surface) of *Rhinoceros sumatrensis*	15
Hind limb (inner aspect) of *Rhinoceros sumatrensis*	19
Hind limb (front aspect) of *Rhinoceros sumatrensis*	20
Hind limb (posterior aspect) of *Rhinoceros sumatrensis*	21
Hind foot (inner surface) of *Rhinoceros sumatrensis*	23
Dissection of side of face of *Rhinoceros sumatrensis*	24
Upper surface of skulls of *Rhacophorus*	28
Head of *Damalis hunteri*	58
Hyracodontotherium filholi. Palatal and lateral aspects of the anterior portion of the cranium, nat. size	68
Horns of *Antilope triangularis*	74
Portion of the tail of *Trichys lipura*	76
Tensores patagii and other muscles of *Polyboroides typicus*	79
Tensores patagii and other muscles of *Serpentarius*	80
Transverse section through the funnel of an advanced embryo of *Sepia*, and of a young specimen of *Taonius*	129
Central and first lateral Teeth of so-called *Physæ*, &c.	139
The venous system of an adult male Frog (*Rana temporaria*)	146
Diagram of the chief veins of *Protopterus annectens*	148
Head of *Sudis jayakari*	241
Structure of *Dendricon rastratum*	251
Cæcum and Colic Loop of *Tapirus terrestris*	254
Upper surface of Brain of *Tapirus terrestris*	256
Lateral view of Brain of *Tapirus terrestris*	257
Phyllium gelonus, imm.	263
Tatocnemis malyassica	301
Diagrammatic representation of the principal relative positions of the intestinal loops (in Birds) when seen from the right side	305

Page
Head of *Damalis hunteri* 373
Skull and horns of *Damalis hunteri*, ♂ ad. 374
Skull and horns of *Damalis hunteri*, ♀ ad. 375
Female organs of *Osphranter erubescens* 435
Female organs of *Macropus major* 438
Enlarged sketch of parts adjacent to urethral orifice of *Osphranter erubescens* 439
Ventral aspect of sexually mature *Dero* 441
Clitellar epithelium of *Dero* 442
Spermatheca of *Dero* 443
Skin of face of *Rhinoceros bicornis* with third (abnormal) horn. 448
Rostrum of *Sclerorhynchus atavus* 450
Diagrammatic section of a Lizard and of one of the Teiidæ, taken through the lungs and liver 465
Syrinx of *Bucorvus abyssinicus* 589
Syrinx of *Buceros rhinoceros* 589
Leg-muscles of *Aceros nipalensis* 591
Patagial muscles of *Bucorvus abyssinicus* 592
Chunga burmeisteri. Skull, under surface 596
Cariama cristata. Skull, under surface 596
Chunga burmeisteri. Ribs, sternum, and pelvis, seen from the side 598
Cariama cristata. Ribs, sternum, and pelvis, seen from the side 599
Chunga burmeisteri. Pelvis, dorsal view 600
Cariama cristata. Pelvis, dorsal view 601

PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

1889.

(PLATES.)

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AND SOLD AT THEIR HOUSE IN HANOVER SQUARE.

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LIST OF PLATES.

1889.

Plate		Page
I.	Eggs of *Cariama cristata*	25
II.	New Spiders	34
III.	Spicules of Plexaurids	47
IV.	*Lichia vadigo*	50
V.	*Æolosoma tenebrarum*	51
VI. VII.	*Lytoloma crassicostatum*	60
VIII.	Fig. A. *Synodontis punctulatus*. Fig. B. *Tylognathus montanus*	70
IX.	Fig. 1. Head of *Eudyptes sclateri*. Fig. 2. Head of *Eudyptes pachyrhynchus*	82
X.	New Species of *Telephoridæ*	96
XI. XII.	New Land-Shells from Koror	112
XIII. XIV.	Anatomy of *Gonatus fabricii*	117
XV.	Fig. 1. *Gymnodactylus horridus*. Fig. 2. *Urostrophus scapulatus*	143
XVI.	*Semnopithecus hosei*	159
XVII. XVIII. XIX. XX.	Structure of *Steatornis*	161
XXI.	Siluroid Fishes	201
XXII.	*Bucklandium diluvii*	208
XXIII.	Map of Palawan and adjacent Islands	220
XXIV.	*Sciurus whiteheadi*	228
XXV.	*Tetraroge guentheri*	236
XXVI.	*Caranx jayakari*	
XXVII.	Fig. 1. *Trigla arabica*. Fig. 2. *T. polysticta*	
XXVIII.	*Monacanthus melanoproctes*	
XXIX.	*Xeromys myoides*	247
XXX.	Præpollex and præhallux of Mammals	259

Plate		Page
XXXI.	*Lithopsyche* and allied Genera	292
XXXII.	Diagrammatic representation of affinities of Birds according to their intestinal convolutions	303
XXXIII.	New or rare Entozoa	321
XXXIV.	*Eretmophorus kleinenbergi*	328
XXXV.–XXXIX.	New Bornean Land-Shells	332
XL.	*Pachyprora mixta*, ♂ et ♀	356
XLI.	Fig. 1. *Zosterops perspicillata*. Fig. 2. *Cinnyris hunteri*	
XLII.	*Damalis hunteri*, ♀	372
XLIII.–XLIV.	New Indian Lepidoptera	396
XLV.	*Python curtus*	432
XLVI.–XLIX.	Body-cavity in Lizards, &c.	452
L.–LIII.	Lepidoptera of Japan and Corea	474
LIV.	Theriodont Vertebræ	572
LV.	Theriodont Limb-bones	
LVI.	New Species of Land-Shells	577
LVII.–LVIII.	*Aurelia aurita*	583
LIX.–LX.	Fat-bodies in Sauropsida	602
LXI.	New Species of *Erotylidæ*	613
LXII.	*Herpestes grandis*	622

PROCEEDINGS

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OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 15, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1888:—

The total number of registered additions to the Society's Menagerie during the month of December was 74, of which 50 were by presentation, 2 by birth, 8 by purchase, and 14 on deposit. The total number of departures during the same period, by death and removals, was 85.

Among these I may call special attention to the young Chimpanzee purchased of Mr. Cross of Liverpool, December 6. This is apparently of the same species as the specimen purchased October 24, 1883 (see P. Z. S. 1883, p. 464, and 1885, p. 673, pl. xli.), which is still living in the Society's Gardens, and is, so far as can be at present ascertained, referable to the Bald-headed Chimpanzee, *Anthropopithecus calvus* (Du Chaillu) [1].

Mr. Bartlett, in his communication to the Society on this subject (above referred to), has pointed out the distinctions between this Chimpanzee and the ordinary form (*A. troglodytes*).

The receipt of a second specimen is of great interest as tending to confirm the validity of the species. A specimen of the common Chimpanzee of about the same age being also in the Society's collection at the present time, it is easy to make a comparison between the two forms.

[1] See on this subject "The Bald-headed Chimpanzee," in 'Nature,' vol. xxxix. p. 254 (Jan. 10th, 1889).

The following letter addressed to the Secretary by Heer F. E. Blaauw, of Amsterdam, relating to the development of the horns of the White-tailed Gnu (*Catoblepas gnu*), as observed in several examples of this Antelope bred in the writer's menagerie, was read:—

"534 Heerengracht, Amsterdam,
December 1888.

"Sir,—I am now able to send you the long promised drawings showing the development of the horns of *Catoblepas gnu*.

"The drawings were taken from a female born July 22nd, 1886. When the young Gnu is born the forehead is covered with thick shining hair of a rich chestnut colour, and the places for the horns are marked by little tufts of hair.

"When the young animal is five or six days old the horns begin to show through the tufts. Remarkable is the position of the ears, which, being made for afterlife, when they are partially covered by the heavy horns, look very long and forlorn, and give the young animal quite an idiotic expression. For a time the horns grow straight, and stand nearly vertically on the head; but gradually the points begin to diverge from each other, which divergence is at its greatest development at the age of eleven weeks (fig. A). At this age what afterwards

Fig. A.

Horns of young *Catoblepas gnu*. 11 weeks old.

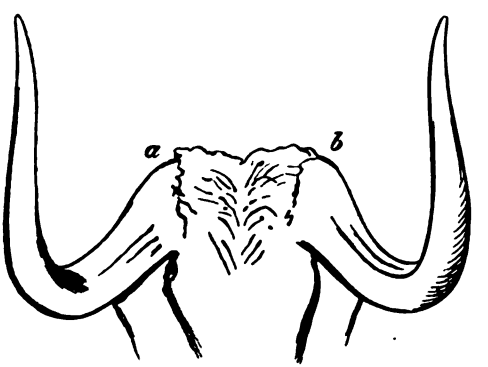
become the straight points in the adult (*a*–*b*, fig. D, p. 4) have come out entirely, and the parts *c*–*b* (fig. D) now begin to make their appearance, during which process the points assume altogether a different position. It is worthy of notice that even at this early period, when the top of the head is as yet quite covered with hair, the place and form of the horny parts (*d* and *c*, fig. D) in the adult are already visible. This also shows that the points of the horns begin to grow out of the head considerably lower in position than where the future bases of the horns will be.

"The part *c*–*b*, fig. D, is now developing, the horn is driven forwards, downwards, and sidewards at the same time, and at the age of 16 months looks like fig. B. This goes on until at 19 months

Fig. B.

Horns of *Catoblepas gnu*. 16 months old.

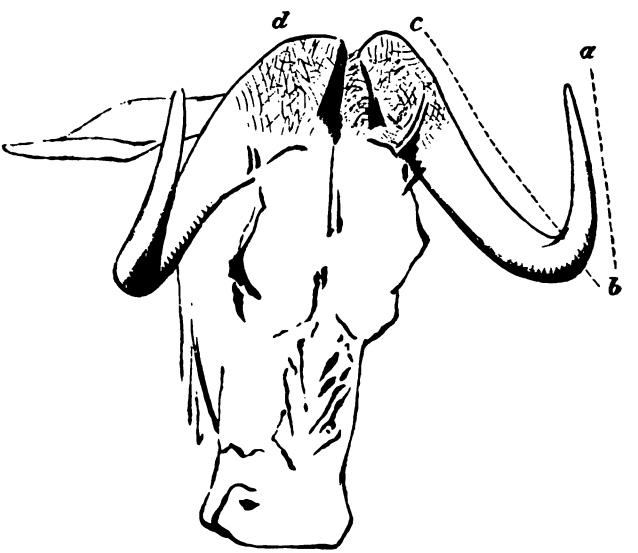
Fig. C.



Horns of *Catoblepas gnu*. 19 months old.

fig C) the frontal or basal parts begin to show, whilst the hairy intermediate part (*a–b*, fig. C) gets narrower and narrower until at the age of two years little of it is left. As the animal gets older this hairy region becomes restricted to a narrow space of from 2 to 4 cm. in width, and is generally narrowest in the males, as in them the horns acquire their greatest development. Until the age of about two years the frontal parts (*a b*, fig. C) are quite smooth; but after this time the roughness which the adults present on these parts begins to appear in the following manner:—At first longitudinal fissures or

Fig. D.



Horns of *Catoblepas gnu*. Adult female.

cracks begin to show, which are gradually cut through by vertical fissures, so that little squares are formed. These soon begin to loosen themselves partially from their bases in such a way that the part furthest from the centre of the front keeps fast, whilst the opposite parts get more or less loose and turned up, so that a kind of ***rough irregular*** scales is formed.

"Whilst the straight parts of the horn are growing, the horny covering or sheath comes off comparatively easily; and it is manifest that the interior with its blood-vessels runs quite up to the top of it. Afterwards the straight points in great part get quite massive and horny: and after this there is little danger of their being broken off, unless by the animal repeatedly rubbing itself against hard stones &c., as it often does when confined in a narrow space.

"As a general remark about the Gnus, I will add that these animals are perfectly hardy and stand all the damp, cold, and snow of a Dutch winter without the slightest difficulty, protected as they are by a woolly coat which in autumn grows under their ordinary hair. They are also very precocious, as the females produce offspring before entering into their third year. Thus, for instance, I have this year bred a young one from a female aged twenty-two months only, and she reared it. To lovers of nature nothing is more interesting than a field with a herd of these animals running and gamboling in the most frantic manner, on which occasions the ridiculous-looking light-coloured little calves generally take the lead. Their wonderful activity and eccentric movements joined to their comparatively heavily built frame are always fresh sources of surprise, and forcibly remind one of Harris's allusion to the Gnu, namely, 'the most whimsical of nature's vagaries.' He could not have expressed himself better!

"Yours &c.,
"F. E. Blaauw."

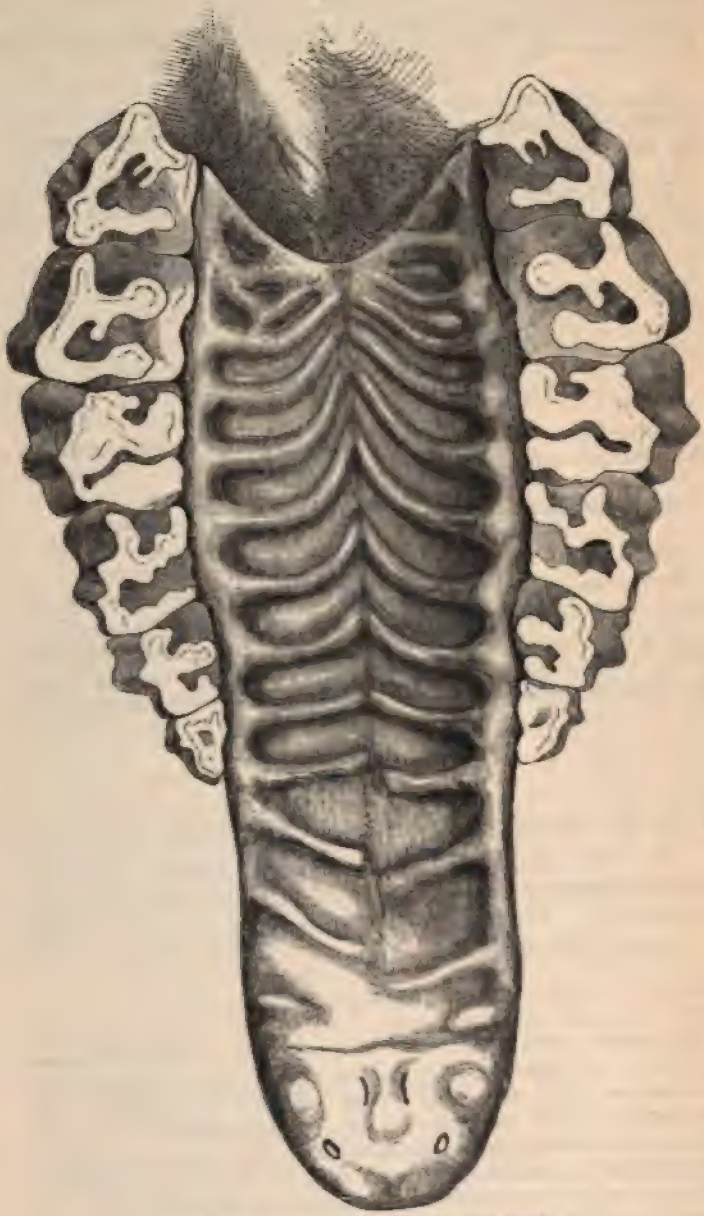
Professor Newton, V.-P., exhibited a specimen of the so-called *Pennula millsi*, remarking:—

"By the kindness of my friend Mr. Scott B. Wilson I am able to show you to-night one of the five known specimens of the bird described by Judge Dole in his 'List of Birds of the Hawaiian Islands,' reprinted from the 'Hawaiian Annual' for 1879 (p. 14), under the name of *Pennula millsi*[1], and believed to be extinct. Mr. Wilson tells me that all these specimens were obtained some thirty years ago by the late Mr. Mills, and that no one has since been able to meet with the species; but knowing the skulking habits of so many of the smaller Rails and Crakes, as well as the very local distribution of many of the birds of the Sandwich Islands, I think it quite possible that the species may still exist, though undoubtedly it has been frequently sought in vain. As Mr. Sclater has already pointed out (Ibis, 1880, p. 241), this is doubtless the so-called '*wingless bird*' of Mr. Pease (Proc. Zool. Soc. 1862, p. 145); but I must add that in almost every respect it appears to me to agree with the 'Dusky Rail' of Latham (Synopsis, iii. pt. 1, p. 237), upon which was founded the *Rallus obscurus* of Gmelin (Syst. Nat. i. p. 718)—a bird not since recognized, so far as I can discover. The identification of the two species, if it can be made, I leave to the discrimination of Mr. Wilson when he comes to work out the fine collections he has made in the Hawaiian Kingdom."

Prof. Bell stated that he had that morning received a letter from a gentleman at Manchester, in which he was informed that *Bipalium kewense* had been observed to eat earthworms. A similar fact had

[1] Accidentally misprinted *millei*.

Fig. 1.



Hard palate of *Rhinoceros sumatrensis*.

Rhinoceros were kept for some weeks while the muscles were in course of dissection.

In performing this task we were greatly assisted by Mr. Tonks, now Physician at the Free Hospital, Grays Inn Road; for most of the drawings which illustrate this paper (woodcuts, figs. 3–10) we are also indebted to that gentleman.

Both the individuals were referred on their arrival at the Gardens to *Rhinoceros sumatrensis*; subsequently Mr. Sclater considered that they were probably examples of his species *Rhinoceros lasiotis*, of which the type is still living in the Gardens. Without going fully into the question of the distinctness of *Rh. lasiotis* from *Rh. sumatrensis*, which cannot be done properly until the death of the type specimen, it may be remarked that there are no characters in the skull which would seem to justify such a distinction. In making a comparison of the skull of these specimens with *Rh. sumatrensis*, particular attention was paid to a paper by Prof. Flower in the 'Proceedings'[1] of this Society, in which a skull possibly identical with Mr. Sclater's *Rh. lasiotis* was compared with *Rh. sumatrensis*. Assuming that problematical skull to represent *Rh. lasiotis*, it is clear that neither of the individuals discussed in the present paper belong to that species, for in all the points raised by Prof. Flower these individuals are typical *Rh. sumatrensis*.

With regard to the visceral anatomy of this species we have not much to add to the description by Garrod; and the species does not differ materially from *Rh. sondaicus*, which we have described somewhat fully in the 'Transactions' (vol. xii.) of this Society.

Garrod describes the ridges upon the hard palate of *Rh. sumatrensis* but gives no figure of it. The accompanying drawing (fig. 1, p. 8) has been made for the purpose of a comparison with the hard palate of *Rh. sondaicus*, which has been figured by us in our memoir upon that Rhinoceros.

The cæcum and the neighbouring parts of the intestines have been figured by Garrod; and as his figure illustrates the principal points in the anatomy of this region of the gut, we have thought it hardly worth while to give a further illustration.

In the loop which is formed by the commencement of the colon, the distal portion is of a narrower calibre, as shown in Garrod's figure.

The mesentery which unites the opposite sides of the loop has a peculiar fold upon it which is illustrated in our figure of *Rh. sondaicus*. In that Rhinoceros the fold in question (*loc. cit.* pl. xxxiv. figs. 1–3) arises near to the cæcum and receives a branch from one of the divisions of the colic artery; at the opposite extremity of the colic loop the band divided into two, which were attached to the surface of the mesentery uniting the parietal sections of the colon; at this point the artery borne by the fold also divides and becomes continuous at two points with the colic artery. It appeared to us at the time we were investigating the anatomy of *Rh. sondaicus* that the azygos artery borne by this fold might serve to supply this

[1] P. Z. S. 1878, p. 634.

region of the gut with blood, if the circulation in the main arteries happened to be occluded.

In the Sumatran Rhinoceros the same fold occurs; but (at least in one specimen) it was of limited extent compared to the fold in the Sondaic Rhinoceros; it commenced at about the same point, but terminated at the beginning of the smooth portion of the colic loop. Furthermore this fold appeared to have no artery; or if an artery was present it must have been very small indeed.

The ileo-cæcal fossa figured and described by us in *Rhinoceros sondaicus* was present in the Sumatran species; but, instead of being large enough to contain the entire fist, it was only of the diameter of the fore finger; this difference is not at all commensurate with the difference in size of the individuals of the two species.

Fig. 2 (p. 11) represents the nasal diverticulum of this species; this organ, which is known to occur in the Horse and in the Tapir, has not yet been described in the Rhinoceros; as will be seen from the figure, it is not widely different from that of the Tapir. Our figure may be compared with the late H. N. Turner's figure (P. Z. S. 1850, p. 104) of the same organ in *Tapirus americanus*.

On some of the Muscles of the Fore Limb.

Rhomboideus.—A small muscle, 8 inches wide, fleshy. It is inserted into the whole length of the vertebral border of the scapula.

Levator anguli scapuli.—A separate one cannot be made out.

Serratus magnus.—An enormous fleshy muscle with very coarse fibres inserted into the venter of the scapula over a surface 10 in. by 6 in. Insertion comes between rhomboideus and subscapularis.

Subscapularis.—This muscle is aponeurotic on the surface, muscular beneath. Arises from whole of the venter of scapula beyond serratus magnus. In contact with supraspinatus above and overlapped origin of triceps below. Arises from aponeurotic covering of triceps. Lower border intimately blended with teres major. It is inserted into the trochanter by a wide tendon. It crossed capsule; bursa between it and capsule in communication with the joint.

Latissimus dorsi.—Crossed whole of triceps, then ran parallel with and underneath teres major. Inserted into front of humerus by a tendon. This tendon was below the trochanter and to the extensor side of the biceps, and under the coraco-brachialis; it was common to the latissimus dorsi and teres major. The great bulk of the latissimus dorsi ended in an aponeurosis. This blended with the aponeurosis of the triceps about four inches from the humerus; the rest passed down and joined the fascia of the forearm over the ulna.

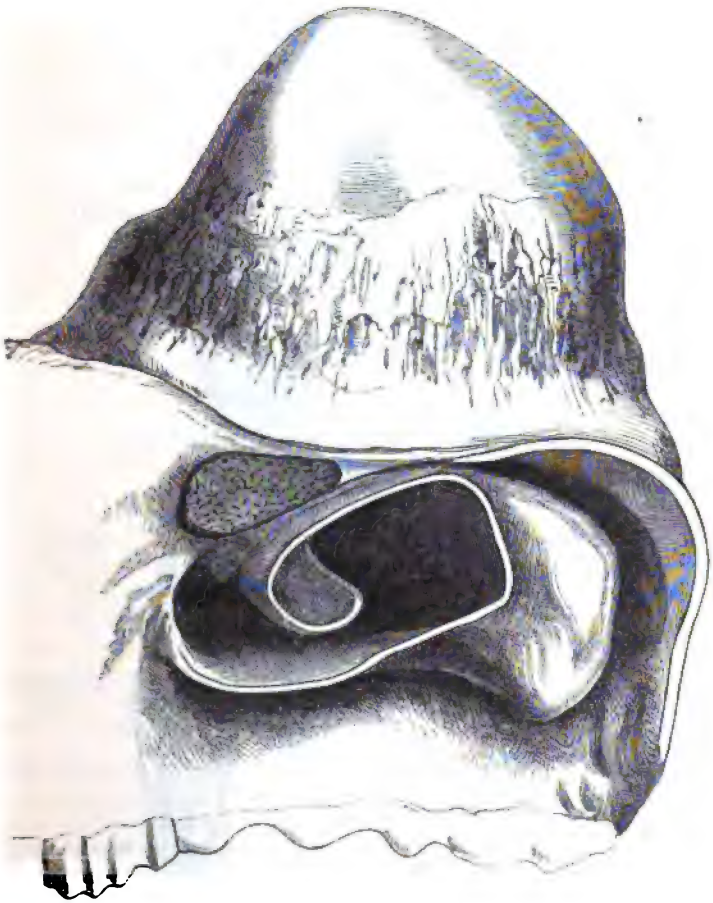
Teres major (fig. 3).—It lies between subscapularis and latissimus dorsi. It arose from inferior angle of scapula, from part of its inferior border, and from aponeurosis at origin of the triceps. Joined the latissimus dorsi.

Coraco-brachialis.—Arises by a strong tendon from the coracoid

process. Inserted into front of the humerus below the latissimus dorsi and just above the condyle.

Its tendon of origin gave off an aponeurosis from its outer side;

Fig. 2.

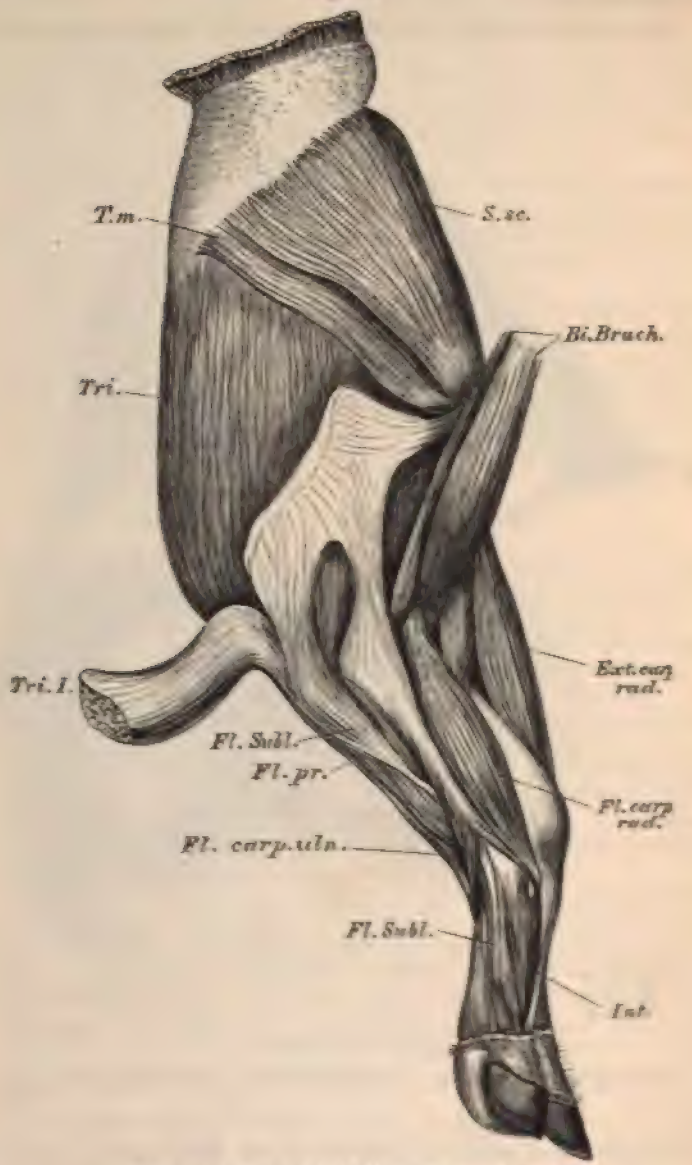


Rhinoceros sumatrensis.

Cartilages of nasal diverticulum, partly cut away to show interior of sac.

this ended in an enormous muscular plane. This muscle was subcutaneous; it was attached to the tip of the trochanter; it blended with the supraspinatus, and covered the biceps; part of it passed back to join the cutaneous part of the latissimus dorsi, and in so

Fig. 3.



Fore limb (inner side) of *Rhinoceros sumatrensis*.

Bi., biceps; *Bruch.*, brachialis anticus; *Ext. carp. rad.*, extensor carpi radialis; *Fl. carp. rad.*, flexor carpi radialis; *Fl. carp. uln.*, flexor carpi ulnaris; *Fl. pr.*, flexor profundus digitorum; *Fl. subl.*, flexor sublimis; *Int.*, interosseus; *S.sc.*, subscapularis; *T.m.*, teres major; *Tri.*, triceps; *Tri.I.*, second head of triceps.

doing covered the muscles of the elbow-joint. The rest joined a large muscle from the chest.

The muscle lay to its outer side and covered the whole humeral

Fig. 4.

Fore limb (anterior surface) of *Rhinoceros sumatrensis*.

Ext. carp. rad. br., extensor carpi radialis brevior; *S.l.*, supinator longus; *Ext. carp. uln.*, extensor carpi ulnaris; *Ext. com. dig.*, extensor communis digitorum; *Ext. carp. rad.*, extensor carpi radialis.

region, not unlike the human deltoid. Its upper part was inserted into the external supra-condyloid ridge of the humerus, lying between the biceps and brachialis anticus.

Biceps.—A fusiform muscle of large size. Arose by single tendon from coracoid process. The tendon passed underneath the supra-spinatus, beneath the muscle from the chest, and was inserted into

the radius at its neck, and joined also the deep fascia of the forearm. Biceps tendon of origin two inches wide and one inch thick.

Supraspinatus.—A huge fleshy muscle, occupying superior border of scapula; covered biceps tendon: inserted on to external tuberosity; it arose from the whole of the supraspinous fossa: it was covered by a dense aponeurosis, and into this a slender muscle from the neck was inserted, the origin of which was not discovered.

Infraspinatus.—This muscle is larger than the supraspinatus; it arises from the whole of the dorsum of the scapula below the supraspinatus; it covered the triceps and is inserted on to the external trochanter.

Extensor Muscles of Forearm (woodcut, fig. 4, p. 13).

Extensor communis digitorum.—Arises from the extensor condyle with the other extensors, from the upper part of the ulna and radius, and from the ulnar border of the radius to halfway down that bone. It passes down as a fleshy muscle, and forms a flat tendon just above the distal end of the ulna and divides into three flat expansions, one for each digit.

Extensor lateralis digitorum.—Arises from the extensor condyle below the extensor communis, and from the shaft of the ulna. Passes down through a groove on the end of the ulna, where it becomes tendinous. The main part of the tendon goes to the first phalanx of the ulnar digit, and there is a slender flattened expansion to the middle digit.

Extensor obliquus metacarpi.—This muscle is bipinnate. It arises by one head from the extensor condyle and from the shaft of the radius, and by another head from the radius. The heads join just above the carpus, and passing round to the radial side of the wrist, the muscle is inserted into the radial metacarpal bone.

Extensor metacarpi.—This arises as a broad fleshy mass from the extensor condyle and from the radius. Passes underneath the extensor obliquus as a very broad and thick tendon over a groove in distal end of radius, to be inserted into the carpal end of the middle metacarpal bone.

Supinator longus.—Rises in common with the other muscles, being the most superior (proximal) one of them, from the extensor condyle. Passes down as a slender muscle to be inserted into the distal end of the radius.

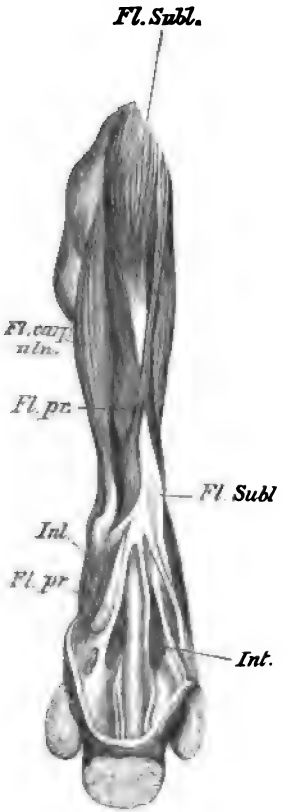
Flexor Muscles of Forearm (woodcut, fig. 5, p. 15).

Flexor externus metacarpi.—Rises from the extensor condyle and from the oleeranon. It is a very big and fleshy muscle: it is inserted by a small tendon into the pisiform bone.

Flexor obliquus metacarpi.—This muscle arises by two heads: (1) by a tendon, in common with the flexor internus metacarpi, from the

flexor condyle, and (2) by a fleshy head partly from the olecranon and partly from the humerus. Its flat fleshy belly passes down, the main tendon passing over, and being connected with, a large sesamoid (?) bone over the distal end of the ulna to be inserted into the pisi-

Fig. 5.



Fore limb (posterior surface) of *Rhinoceros sumatrensis*.

Fl. subl., flexor sublimis; *Fl. carp. uln.*, flexor carpi ulnaris; *Fl. pr.*, flexor profundus digitorum; *Int.*, interosseus.

form bone; a few fleshy fibres, given off before the muscle becomes tendinous, are inserted into the radial side of the carpus.

Flexor internus metacarpi.—Arises from the flexor condyle (there is a bursa half an inch in diameter between the muscle and the condyle) as a big fleshy mass. Passes down in a groove on the

radius, and, becoming tendinous above the wrist, is inserted into the proximal end of the radial metacarpal bone.

Flexor sublimis (*perforatus*).—Arises, in common with the flexor profundus, from the flexor condyle. Passes down as a large fleshy muscle; becomes tendinous at wrist, under annular ligament, and there divides into three small tendons, expanding into sheath at bases of phalanges, from inner side of which sheath expansions go forward to be inserted into the base of the second phalanx.

Flexor profundus (*perforans*).—This has a similar origin to last described muscle (flexor sublimis). Becomes a very big tendon, and dividing over the metacarpus lower than the above, passes through a thick sheath to the base of the last phalanx.

Palmaris longus.—This is a muscle which is apparently not described in the Horse, arising by a short thick fleshy belly from the olecranon; the fleshy part of the muscle is short and is succeeded by a wide and thin tendon which passes into flexor profundus at the wrist.

Interossei.—There are four interossei muscles.

The presence of a *palmaris longus*, if we are right in thus identifying the muscle described above under that name, is interesting for the reason that it does not occur in the Horse, but does in the Tapir.

The following table shows the resemblances and differences between the Rhinoceros, Horse, and Tapir in the extensor and flexor muscles of the arm :—

	Rhinoceros.	*Horse.*
Ext. comm. digit...	*Origin*:—(1) Extensor condyle; (2) upper part of ulna and radius; (3) from ulnar border of radius to halfway down that bone. *Insertion* upon all 3 digits.	*Origin*:—(1) Extensor condyle; (2) humerus below extensor condyle; (3) the anterior border of external ligament of articulation of elbow; (4) superior and external tuberosity of radius; (5) external border of radius.
Ext. lat. digit.....	*Origin*:—(1) Extensor condyle; (2) shaft of ulna. *Ins.* 1st phalanx of ulnar digit and (by a slight tendon) to middle digit.	*Origin*. From external tuberosity of radius and from shaft of radius and ulna, *not* from humerus.
Ext. obl. met.	*Origin by one head* from exterior condyle and shaft of radius; *by 2nd head* from radius. *Ins.*, radial metacarpal.	*Origin*. Only *one head* from external side of radius.
Flexor ext. met....	*Origin* from extensor condyle and olecranon. *Ins.* into pisiform.	*Insertion* by 2 tendons: (1) on to pisiform; (2) outer metacarpal.

	Rhinoceros.	*Horse.*
Flex. obl. met. ...	*Origin by one head* from flexor condyle, *by a 2nd head* partly from olecranon and partly from humerus. *Ins.* (1) by a tendon upon pisiform; (2) by fleshy fibres upon radial side of carpus.	*Origin.* By two heads as in Rhinoceros. 2nd head arises *only* from olecranon. *Insertion* only on to pisiform.
Flex. int. met. ...	*Origin* from flexor condyle. *Ins.* proximal end of radial metacarpal.	The same.
Flex. perforatus...	*Origin* from flexor condyle. *Ins.* bases of 2nd phalanx of all 3 digits.	The same, allowing for absence of phalanges of 2nd and 4th digits.
Flexor profundus.	*Origin* from flexor condyle. *Ins.* bases of last phalanx of each digit.	*Origin*:—(1) From flexor condyle; (2) olecranon; (3) posterior surface of radius.
Palmaris longus (?)	Present.	Absent.
Ext. met.	*Origin.* Extensor condyle and radius. *Ins.* carpal end of middle metacarpal.	*Origin* only from humerus.

	Rhinoceros.	*Tapir.*
Extensor met......		*Origin* only from humerus.
Ext. comm. digit.		*Origin*:—(1) Outer condyle; (2) head of radius; (3) from middle of ulna.
Ext. lat. digit. ...		*Origin* from extensor condyle and from ulna and radius. *Insertion*, outer digits 3 and 4.

It will be seen from the above tabular comparison of some of the muscles of the Rhinoceros with the corresponding muscles of the Horse that there are some differences, particularly in the extensors.

We shall now compare the myology of *Rhinoceros* with that of *Hyrax*; our comparison is not based upon a dissection of *Hyrax*, but upon the detailed account of the muscular anatomy of that animal by Messrs. Murie and Mivart[1].

The extensor muscles of the manus in Rhinoceros are, as in the Horse, only four in number; the corresponding muscles in *Hyrax* appear to be as follows:—

Rhinoceros, Horse.	*Hyrax.*
Extensor communis digitorum.	*Extensor communis digitorum.*
Extensor lateralis digitorum.	*Extensor minimi digiti.*
Extensor obliquus metacarpi.	*Extensor ossis metacarpi pollicis.*
Extensor metacarpi.	*Extensor carpi longior.* / *Extensor carpi brevior.*

[1] P. Z. S. 1865, p. 329.

Hyrax possesses in addition an *extensor carpi ulnaris*, which is wanting in the Ungulates.

In *Hyrax* the *extensores primi, secundi internodii*, and *indicis* are wanting, which is so far a resemblance to the Ungulate in that the last two of these muscles are present in the Rabbit[1] and apparently in *Hydromys*.

The *supinator longus*, which we have described in the Rhinoceros, is absent in the Horse, and according to Meckel, quoted by Messrs. Murie and Mivart, in many Rodents. Windle[2] asserts its absence in *Hydromys*, and Huxley in the Rabbit. Its presence in *Hyrax* is therefore of particular interest and also its presence in the Tapir.

Muscles of the Hind Limbs (figs. 6, 7, 8, 9).

Iliacus.—This muscle is largely tendinous upon the inner side; its origin is from the whole of the iliac fossa.

Psoas.—A small muscle dividing into two tendons; both are inserted into lesser trochanter, curving round femur from before back.

Psoas parvus.—The upper part of the belly is muscular but soon becomes tendinous; it is continuous with the sartorius (see fig. 7).

Gracilis.—The gracilis is enormously wide and muscular throughout; it arises from pubic arch and is inserted by a large muscular and tendinous insertion into fascia above the inner side of the knee, which is continued on to patella and then on to inner side of tibia.

Pectineus is a fleshy, somewhat flat oblong-shaped muscle; it arises from pubis along pectineal line; it is inserted on to the femur as in the Horse.

Adductor longus.—Arises from ramus of pubis, where it is blended with adductor magnus; its insertion is the same as that of the gracilis, except that it also is attached to the lower end of the femur; it is partly covered by gracilis.

Adductor magnus is a large fleshy muscle with but little tendon; its origin is muscular and it is here fused with adductor longus as already stated; its insertion is to inner side of shaft and to inner condyle of femur; it forms a tendinous arch for artery at junction of middle and lower third.

The *Rectus* and two *Vasti* were fused into a single muscle, the elements of which were indicated by aponeuroses; the muscle is inserted on to patella.

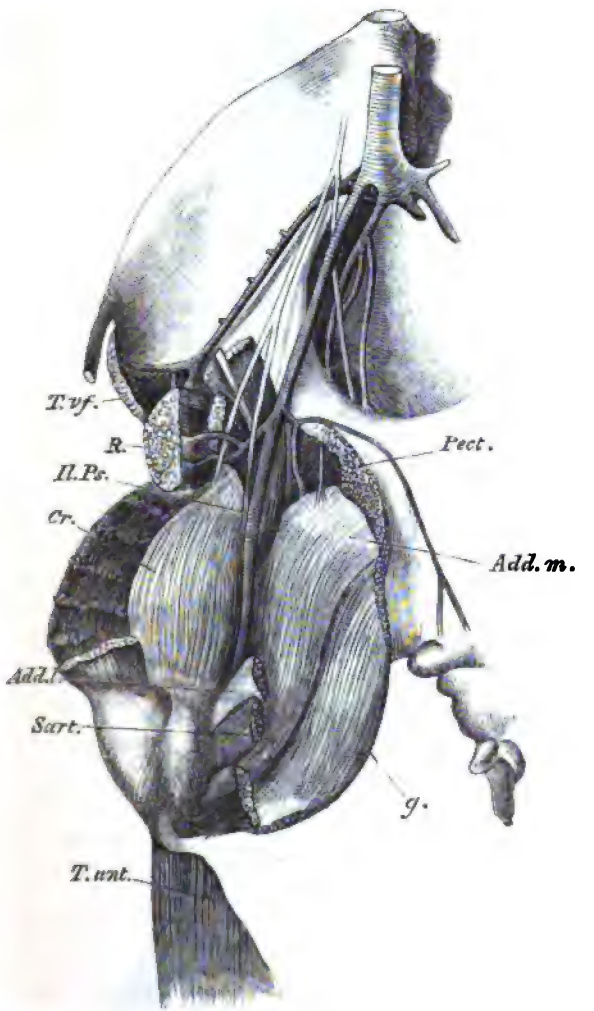
Semimembranosus.—This muscle is united to form one muscle with the semitendinosus; it is inserted by a flat tendon parallel with and $\frac{1}{4}$ inch behind the crest of tibia; this tendon is three inches long.

The *Peronei* muscles are four in number:—

(1) Originates from the outer side of the head of the fibula and

[1] Huxley, 'Anatomy of Vertebrates,' p. 439.
P. Z. S. 1887, p. 56.

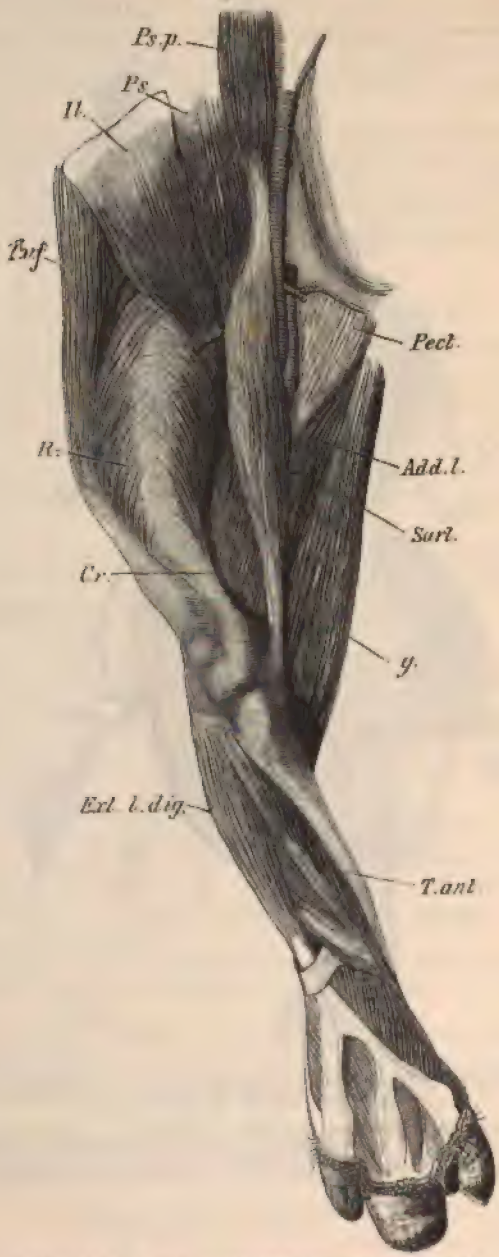
Fig. 6.



Hind limb (inner aspect) of *Rhinoceros sumatrensis*. The branches of the aorta and the nerves are not lettered.

Add.l., insertion of adductor longus; *Add.m.*, adductor magnus; *Cr.*, cruræus; *g.*, gracilis; *Il.Ps.*, iliacus and psoas; *Pect.*, pectineus; *R.*, rectus; *Sart.*, sartorius; *T.ant.*, tibialis anticus; *T.v.f.*, tensor vaginæ femoris.

Fig. 7.



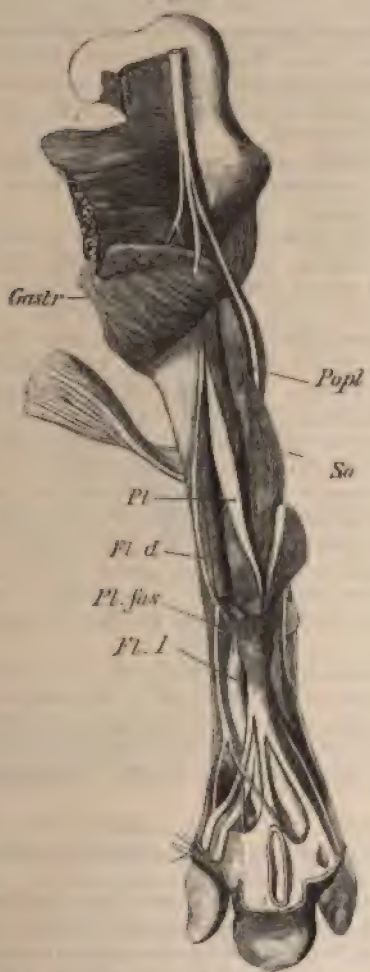
Hind limb (front aspect) of *Rhinoceros sumatrensis*.

Ext.l.dig., extensor longus digitorum; *Ps.p.*, psoas parvus (continuous with sartorius); *Ps.*, psoas; *Il.*, ilineus; *Pect.*, pectineus; *Cr.*, cruræus; *g.*, gracilis; *Add.l.*, adduc[illegible]us; *R.*, rectus; *Sart.*, sartorius; *T.ant.*, tibialis anticus; *T.e*[illegible]ine femoris.

also from the shaft of that bone; it passes down through a groove to be inserted into the head of outer metatarsal.

(2) The second peroneal has a common origin with the first

Fig. 8.



Hind limb (posterior aspect) of *Rhinoceros sumatrensis*.

Fl.d., flexor longus digitorum; *Gastr.*, gastrocnemius; *Pl.*, plantaris; *Pl.fas.*, plantaris fascia; *Popl.*, popliteus; *So.*, soleus; *Fl.l.*, tendon of flexor longus.

from head of fibula; it is separated below by a ridge of bone; it is inserted into metatarsal bone of outer toe.

(3) Arises from the shaft of the fibula behind and below the other peroneal muscles; it passes down beneath the tendon of second peroneal and is inserted on to the cuboid bone.

(4) The fourth peroneal is a small muscle arising from the lower part of the first peroneal; it is inserted into the tendon of the third peroneal.

Extensor communis digitorum.—This muscle arises from the upper part of the tibia; it is a fleshy muscle and passes down through a well-marked annular ligament; its tendon divides into three branches; two very strong ones supply inner and outer toes; the tendon of middle toe is very slender.

The *anterior tibial* arises by two muscular bands from the shaft of the tibia; it is inserted below into the base of the inner metatarsal bone and tarsus.

Extensor brevis digitorum arises from astragalus, and is inserted mainly into the middle toe together with the *longus*, but forming much the larger part of the tendon; some fibres go to the inner toe, *none* to the outer.

Flexor communis digitorum.—This is a large fleshy muscle and takes the place of the *flexores longus*, *longus pollicis*, and of the *tibialis posticus* in Man. It arises from the posterior surface of the tibia and of the fibula; the origin from the fibula extends as high up as a ridge on its head; it also arises from fascia over popliteal; from the tibia it arises only from the outer side of the lower part of the shaft: the muscle becomes tendinous at the ankle and passes over a trochlear surface formed partly of cartilage and in connection, as it appeared, with the calcaneo-cuboid ligament; it communicates by a tendinous slip with the *flexor brevis* and then divides into three tendons, each of these passes under a sheath formed by the *flexor brevis*, and is inserted at the base of the last phalanx of its digit.

The *Flexor brevis* is entirely tendinous and is really nothing more than a continuation of the *plantaris*[1]; it divides into three tendons, each of which forms a sheath for the *longus* to go through, and from the inner wall of the sheath small tendons are continued forwards to the base of the second phalanx; the three sheaths seem to be joined at the side.

The *Lumbricales* are four in number; three of these are in connection with *longus* and one seems to arise from the outer tendon of long and short flexors.

There are *Interossei* muscles in each space and on both sides.

The *Gastrocnemius* is a large muscle; it arises from the femur by two heads; it passes down and is attached to *os calcis*.

The *Plantaris* is a slender strong muscle; it arises from the outer condyle of the femur; it passes down under *gastrocnemius* to *os calcis*, where it spreads out and passes over a smooth cartilaginous surface upon the bone and forms the *flexor brevis digitorum*.

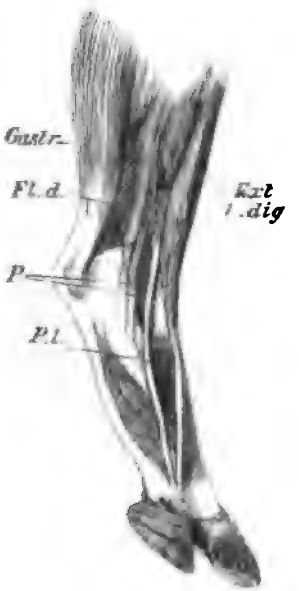
The *Popliteus* is a large muscle; it arises from the external condyle of fen obliquely downwards and inwards to be

[1] Mammals.

inserted into tibia; the lower part (about half) was covered by *flexor communis digitorum*.

Great importance is attached by Dr. G. E. Dobson[1] to the presence or absence of a connection in the foot between the *flexor communis digitorum* and the *flexor brevis*; we have shown that this connection exists in *Rhinoceros*, which therefore forms no exception to the rule laid down by that anatomist.

Fig. 9.



Hind foot (inner surface) of *Rhinoceros sumatrensis*.

P.l., peroneus longus; *P*, peronii; *Gastr.*, gastrocnemius; *Ext.l.dig.*, extensor longus digitorum; *Fl.d.*, flexor longus digitorum.

These flexor muscles agree very closely with those of the Horse and of the Tapir; in both these Ungulates and in *Hyrax* there is no separate *Tibialis posticus*.

The *Peronei* of the Rhinoceros are, on the other hand, far more complicated than in the Horse, where one only has been described. In *Hyrax* Murie and Mivart only describe two peroneal muscles. No reliable taxonomic conclusions can be drawn from the relations of these muscles, since in *Lepus* and *Hydromys* the peroneals are as complicated as in Rhinoceros.

[1] "On the Homologies of the long Flexor Muscles &c.," Journ. Anat. Phys. vol. xvii. p. 142.

The following is a tabular statement of the condition of certain muscles in the Rhinoceros and Horse.

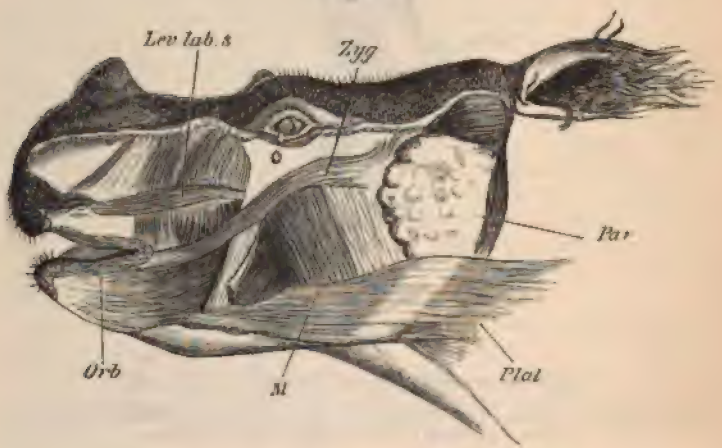
	Rhinoceros.	*Horse.*
Ext. comm. dig. ...	Arises from tibia.	Arises from between external condyle and trochea of femur.
Peronei	Four separate muscles.	Only one muscle.
Anterior tibial ...	*Origin* by two heads from tibia. *Ins.* radial metatarsal and tarsal.	Forms two separate muscles, one tendinous arising from femur, the other fleshy from tibia.

Muscles of the Head and Neck (fig. 10).

Fig. 10 illustrates the principal muscles of the head as seen from the side.

Fig. 10 may be compared with the woodcut (fig. 97) illustrating

Fig. 10.



Dissection of side of face of *Rhinoceros sumatrensis*.

Par., parotid gland; *Lev.lab.s.*, levator labii superioris alæque nasi; *M.*, masseter; *Orb.*, orbicularis; *Plat.*, platysma; *Zyg.*, zygomaticus.

the corresponding muscles in the Horse in Chauveau's book, and with plate viii. of Murie's memoir upon the Sumatran Tapir.

The *Zygomatic* arises from the zygoma just in front of the anterior edge of the parotid gland; it is inserted near to the margin of the lower lip at its hinder part close to the angle of the mouth. This muscle is much more important than in the Horse, where it is a small superficial slip arising from the surface of the masseter and inserted at a considerable distance away from the corner of the

J. G. Keulemans del. et lith.

Mintern Bros. imp.

EGGS OF CARIAMA CRISTATA.

mouth. In the Tapir this muscle, although shorter, is more like the corresponding muscle of the Rhinoceros; it has the same origin from the bone and is inserted near to the corner of the mouth.

The *Maxillo-nasal* seems to be, if anything, rather less developed in the Rhinoceros than in the Horse; it is not indicated in Murie's figure of the Tapir.

The *Levator labii superioris alæque nasi* is composed of two portions, which are decidedly more distinct from each other than in the Horse; the lowermost portion of this muscle, which is attached to the lower jaw, corresponds to the muscular slip regarded by Chauveau as homologous with the *risorius*.

The remaining muscles of the head as shown in fig. 10 call for no special comment.

3. On the Breeding of the Seriemá (*Cariama cristata*). By Alfred Newton, V.-P.

[Received January 15, 1889.]

(Plate I.)

It may perhaps be remembered that as nearly as possible eight years ago our Foreign Member, Professor Alphonse Milne-Edwards, entrusted to my care for exhibition to this Society a specimen of the egg of *Cariama cristata* which had been laid in the Jardin des Plantes, and that I then expressed (P. Z. S. 1881, p. 2) the hope that our own Gardens would, sooner or later, produce a similar example. That hope has been more than fulfilled, and our Secretary, in placing in my hands the eggs now before you (Plate I.), has requested me to make a few observations upon them.

These eggs were laid by a bird presented to the Society on the 12th of August 1884 by Captain Jones, which had paired with a male bought by the Society on the 23rd of August 1882. Both are still living in our Gardens. The eggs were laid about the 15th of May 1887 in a rude nest built in a basket placed on one of the perches of a compartment in the Eastern Aviary, at the height of about a dozen feet from the ground. I understand that the mother sat upon them, but that they were found to be broken, and were then removed.

So far as my memory serves me, these eggs present exactly the same characters as that which was laid in the Jardin des Plantes, and which was exhibited by me on the occasion just mentioned. They also resemble in the same way that figured by Thienemann (Fortpflanz. der gesammt. Vögel, tab. lxxii. fig. 14) to which I then referred; but Mr. Keulemans's drawings (Plate I.) are sufficiently exact to make further description unnecessary.

In May 1888 this same hen *Cariama cristata* laid two eggs, but both were destroyed, as is believed, by the parents.

About the 21st of June 1888 she laid another egg in the same basket, and this was hatched on the 24th of July. The young bird was seen by our Secretary and our Superintendent, the latter of whom informs me that it had much the look of a newly-hatched Heron. Its eyes were open, and it was clothed with greyish-brown down. On the next day the keeper (Church) found it had disappeared, it having been doubtless eaten by one or other of its parents.

Another egg laid by the same bird was hatched on the 7th of September 1888. Our Superintendent, to guard against a repetition of the former misfortune, abstained from any inspection of it, but unhappily to no effect, for on the following day this nestling also was found by the keeper (Samuel Bartlett) to have vanished, having doubtless gone the same way as its deceased brother or sister.

February 5, 1889.

Professor Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1889 :—

The total number of registered additions to the Society's Menagerie during the month of January was 50. Of these 1 was by birth, 22 by presentation, 17 by purchase, 2 by exchange, and 8 were received on deposit. The total number of departures during the same period, by death and removals, was 116.

The most noticeable additions during the month were :—

1. A small collection of birds from Algeria obtained by purchase from a dealer at Oran on January 10th. Among these are specimens of Clot-Bey's Lark (*Ramphocorys clot-beyi*), the Algerian Shore-Lark (*Otocorys bilopha*), and the Rosy Bullfinch (*Erythrospiza githaginea*), all new to the Society's collection.

2. Two White Ibises, purchased January 18th, and differing from the White Ibises we have previously had in the Society's collection in their larger size and bright red bills, as will be at once manifest on an examination of the specimens now in the Gardens. They would appear to belong to the species (or subspecies) designated by Wagler (Isis, 1829, p. 760) *Eudocimus longirostris*. On the other hand, on referring to Baird, Brewer, and Ridgway's 'Water Birds of North America' (vol. i. p. 89), it will be seen that their *Eudocimus albus* is the larger red-billed bird. This subject therefore requires fresh investigation, and I commend it to the notice of American Ornithologists.

Mr. Sclater exhibited a living specimen of the Thick-billed Lark (*Rhamphocorys clot-beyi*) out of a flock of five which the Society had lately received from Algeria, and called attention to its peculiarities.

Little had been added to our knowledge of this curious form since the publication of the notice of it in Dresser's 'Birds of Europe' (iv. p. 383, pl. 242).

The specimens in the Society's collection had been purchased from M. Augéard, Préparateur Naturaliste, 22, Rue des Casernes, Oran, and were believed to have been captured in the south of the Province of Oran.

In a recently published number of the 'Journal für Ornithologie' (1888, p. 225) would also be found a notice of specimens of this Lark having been obtained by Dr. A. Koenig in the Tunisian Sahara in May 1887.

Dr. Günther, F.R.S., exhibited and made remarks on some fishes which had been dredged up by Mr. John Murray off the west coast of Scotland, and were not previously known to occur in British waters, viz., *Cottus lilljeborgii* (Collett), *Triglops murrayi*, sp. n., *Gadus esmarkii* (Nilss.), *Onus reinhardti* (Collett), *Fierasfer acus* (Brünn.), *Scopelus scoticus*, sp. n., and *Stomias ferox* (Ruhrdt.).

The following communications were read:—

1. On the Species of *Rhacophorus* confounded under the name of *R. maculatus*. By G. A. Boulenger.

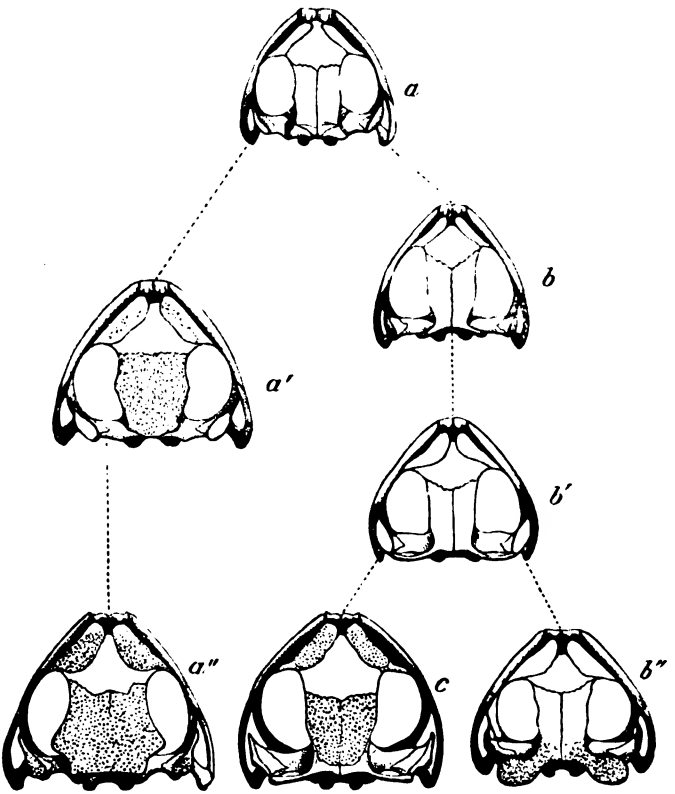
[Received January 15, 1889.]

A recent reinvestigation of the material in the British Museum has convinced me that several species have been confounded by me, as well as most of my predecessors in Indian herpetology, under the name of *Rhacophorus* (or *Polypedates*) *maculatus*. Apart from *R. sexvirgatus*, Gravh.[1] (*quadrilineatus*, Wgm.), which is nothing but a colour-variety of the eastern form, *R. leucomystax*, Gravh. (*rugosus*, D. & B.), two species have been described, upon the value of which herpetologists have been in doubts, viz. *Polyp. cruciger*, Blyth, and *P. scutiger*, Ptrs., both from Ceylon. The former was separated on account of its larger size and coloration. Nevill, who has recently taken up the matter again, distinguishes it from *R. maculatus* by its much larger size, stouter feet, and the uniform colouring of the hinder part of thighs, which never present any approach to the white or yellow spotting and marbling observable in *R. maculatus*. Neither the characters pointed out by Blyth nor those given by Nevill can serve to distinguish *R. cruciger* from the continental *R. maculatus*, if the latter be taken in the customary comprehensive sense; and the total absence of white spotting on the thigh is so far from being constant that one of the specimens in the British Museum,

[1] *Hylorana longipes*, Fischer, of which the type specimen is now in the Museum, is another synonym of this variety.

an otherwise typical *R. cruciger*, 34 millim. long from snout to vent, from Dr. Kelaart's collection, has the flanks and the sides of the thighs spotted with white on a brown ground.

Polypedates biscutiger was established by Peters for specimens from Rambodde, Ceylon, "agreeing with *P. maculatus* in size and appearance, but easily distinguished by bony nuchal prominences, which are especially distinct in the adult, the smaller tympanum,



Upper surface of skulls of *Rhacophorus*.

a. *R. leucomystax*, Darjeeling; *a'*. Ditto, China; *a''*. Ditto, Celebes. *b*. *R. maculatus*, Nilgherries; *b'*. Ditto, Bombay; *b''*. Ditto, Ceylon. *c*. *R. cruciger*, Ceylon.

All the figures are taken from adult females.

and the colour of the thighs, the hinder side of which bears large yellow spots on black-marbled ground." But these being precisely the characters of the true *R. maculatus* from India and Ceylon, it is clear that Peters based his comparison on the other Ceylonese form, *R. cruciger*, which he probably regarded as the typical *R. maculatus*. *P. biscutiger*, Ptrs., is therefore a synonym of *R. maculatus*, Gray.

I am nevertheless satisfied that both Blyth and Peters were correct in distinguishing two species in Ceylon, as were likewise the authors of the 'Erpétologie générale' in distinguishing the Indian (Bengal, Pondichery, Malabar) from the Malayan (Java, Philippines) form, although they made the mistake of applying to the former the name *leucomystax*, which belongs to the latter, their *P. rugosus*.

The comparison of fully adult skulls shows very great differences between the extreme types; and these differences corresponding with certain external characters, though of a very trivial nature, and with the habitats, it is difficult not to admit that they deserve recognition in the system. But if a large series of examples be examined, the gaps between the various forms are nearly completely bridged over, as may be seen from the figures (p. 28), which at the same time afford an excellent example of derivation of characters and speak clearly against the systematic value of certain cranial structures to which Cope still attaches undue importance[1].

However, I think it best to distinguish as species the three following forms, and I will proceed to give their characters, synonymy, and distribution.

RHACOPHORUS LEUCOMYSTAX.

Hyla leucomystax, Gravenh. Delic. Mus. Vratisl. p. 26 (1829).

Hyla sexvirgata, Gravenh. *l. c.* p. 28.

Hyla quadrilineata, Wiegm. N. Acta Ac. Leop.-Carol. xvii. i. p. 260, pl. xxii. fig. 1 (1835).

Polypedates leucomystax, Tschudi, Class. Batr. p. 75 (1838); Cantor, Cat. Mal. Rept. p. 142 (1847).

Polypedates rugosus, Dum. & Bibr. viii. p. 520 (1841).

Polypedates maculatus, part., Günth. Cat. Batr. p. 78 (1858), and Rept. Brit. Ind. p. 428 (1864); Stoliczka, Proc. As. Soc. Beng. 1872, p. 106.

Polypedates quadrilineatus, Günth. *ll. cc.* pp. 79 & 429; Anders. Proc. Zool. Soc. 1871, p. 207.

Polypedates maculatus, Anders. *l. c.*

Polypedates megacephalus, Hallow. Proc. Ac. Philad. 1860, p. 507.

Rhacophorus maculatus, part., Boulenger, Cat. Batr. p. 83 (1882).

Hylorana longipes, Fischer, Arch f. Nat. li. p. 47 (1885).

The largest specimen (from Siam) in the Collection measures 81 millim. from snout to vent.

No connection between the fronto-parietals and the squamosals. In the Himalayan specimens examined (six from Darjeeling and one

[1] Prof. Cope, in a notice of the British Museum Catalogue of Batrachians (*cf.* Am. Nat. 1883, p. 181), expresses the hope that, if another edition of the work is called for, the author will modify it by the adoption of the genera characterized by the degree of ossification of the cranial bones, which would divide *Hyla* into four genera, viz. *Hyla*, *Scytopis*, *Osteocephalus*, and *Trachycephalus*. If these principles were applied to the *Rhacophori*, we should have at least three genera in the *maculatus*-group; just as, on account of the presence of a fronto-parietal fontanelle, *Bufo calamita* is placed by Cope in a distinct genus away from *B. viridis*. In fact, he has recently ('Origin of the Fittest,' p. 82) proposed to restrict the genus *Polypedates* to the species with rugose skull.

from Sikkim), measuring up to 68 millim. from snout to vent, and in a single Formosan, 60 millim. long, the skin is perfectly free from the skull, which shows no trace of rugosities, and the width of the interorbital space equals or a little exceeds the width of the upper eyelid. The skull of Chinese specimens, up to 48 millim., resembles that of the Himalayan, whilst larger specimens, up to 70 millim., are intermediate between the latter and the Burmese-Malayan, both as regards the width of the interorbital space and the rugosities, the skin adhering to the fronto-parietals, but not to the nasals. In all the other specimens (Rangoon, Tenasserim, Siam, Camboja, Cochinchina, Singapore, Sumatra, Nias, Borneo, Java, Philippines, Celebes) the skin adheres to the fronto-parietals in individuals only 40 millim. long; and in the adult the interorbital space becomes very broad and concave, once and a half to twice the width of the upper eyelid, strong angular postorbital processes are developed, and the skin adheres not only to the fronto-parietals but also to the nasals and squamosals, as may be seen at *a''* in the figure (p. 28). Here follow some measurements, in millimetres, of the skulls of specimens from various localities :—

	♀. Darjeeling.	♀. S. China.	♀. Rangoon.	♀. Manado.	♀. Siam.
Length of skull	19	23	20	24	25
Width of skull.....	21	24	21½	27	28
Width of fronto-parietals in front.....	6½	9	8½	10	11
Width of fronto-parietals at postorbital processes...	6½	10	9½	15	19

Disk of third finger one half to three fifths the diameter of the eye. In some specimens the tibio-tarsal articulation reaches the eye, in others the end of the snout, in most between these two points.

This species presents the well-known colour-variety characterized by longitudinal dark bands on the head and body (var. *sexvirgata* s. *quadrilineata*). But, as already noticed by Anderson on an Assamese specimen, the passage between this variety and the typical form exists; we have such intermediate specimens from Darjeeling and from Formosa. In spotted examples, a small X- or hourglass-shaped dark marking, extending to between the eyes, is frequently present. The hinder side of the thighs is usually brown, with small whitish spots; but these may be absent, as usually in *R. cruciger*, or they may be large and separated by a dark network, as usually in *R. maculatus*; these variations do not correspond with any other that I can find.

Hab. Southern China and Eastern Himalayas to the Malay Peninsula and Archipelago.

RHACOPHORUS MACULATUS.

Hyla maculata, Gray, Ill. Ind. Zool. i. pl. lxxxii. fig. 1 (1832).

Bürgeria maculata, Tschudi, Class. Batr. p. 75 (1838).

Polypedates leucomystax, Dum. & Bibr. viii. p. 519 (1841).

Polypedates leucomystax, part., Kelaart, Prodr. Faun. Zeyl. p. 193 (1852).

Polypedates maculatus, part., Günth. Cat. Batr. p. 78 (1858), and Rept. Brit. Ind. p. 428 (1864); Stoliczka, Proc. As. Soc. Beng. 1872, p. 106.

Polypedates maculatus, Blanf. Journ. As. Soc. Beng. xxxix. p. 376 (1870).

Polypedates biscutiger, Peters, Mon. Berl. Ac. 1871, p. 649.

Rhacophorus maculatus, part., Bouleng. Cat. Batr. p. 83 (1882).

The largest specimen (from Malabar) in the Collection measures 73 millim. from snout to vent.

The posterior border of the fronto-parietals is produced on each side into a process which joins, or is connected by ligament with, the squamosal. The above figures show the amount of variation in the development of this parieto-squamosal arch, irrespective, apparently, of age and locality. The nasals and fronto-parietals are smooth, except in specimens which have the posterior arch much thickened, in which case that region is finely sculptured; but the skin never adheres to any part of the skull. The fronto-parietals are broadest in front, and the postorbital processes merely indicated.

Disk of third finger two fifths to one half the diameter of the eye. The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout. Interorbital space once to once and one third the width of the upper eyelid.

Upper parts variously spotted, never banded; hinder side of thighs with large yellow spots, usually separated by a purplish-brown network.

Hab. India and Ceylon. Specimens in the British Museum from Ganjam, Madras, Bombay, Salem, Malabar, Nilgherries, and Ceylon.

According to Nevill, *R. maculatus* is found in the hot dry parts of Ceylon, from Putlam, across the island, and south to Batticaloa; it has a peculiar fondness for houses. Thurston (Cat. Batr. S. Ind. 1888) remarks that it is common in Madras at night, adhering to walls and windows, and is known among Europeans as the "chunam frog," from the frequency with which it is found on chunam (shell-lime) walls.

Rhacophorus cruciger.

Polypedates leucomystax, part., Kelaart, Prodr. Faun. Zeyl. p. 193 (1852).

Polypedates cruciger, Blyth, in Kelaart, *op. cit.* App. p. 48 (1852).

Polypedates maculatus, part., Günth. Cat. Batr. p. 78 (1858); and Rept. Brit. Ind. p. 428 (1864).

Rhacophorus maculatus, part., Bouleng. Cat. Batr. p. 83 (1882).

Rhacophorus cruciger, Nevill, Taprobanian, iii. p. 6 (1888).

The largest female specimen measures 85 millim. from snout to vent, the largest male only 56.

This species is more constant in cranial characters and in coloration than its two nearest allies. In general appearance it strongly resembles the likewise Ceylonese *R. eques*.

A slender bony parieto-squamosal arch. Skin adherent to the rugose nasals and fronto-parietals; latter bones broadest in front, without or with a mere indication of postorbital processes. Interorbital space once to once and a half the width of the upper eyelid.

Digital expansions larger than those in *R. maculatus*, that of the third finger measuring one half to two thirds the diameter of the eye. The tibio-tarsal articulation reaches the end of the snout or a little beyond.

No large dorsal spots, but usually a large dark or black-edged hourglass-shaped marking extending from between the eyes to in front of the sacrum; hinder side of thighs brownish, uniform or with small whitish spots.

Hab. Ceylon. Nevill states that he has examined some hundred or more, of both sexes, of this frog and of *R. maculatus*, as found in Ceylon, without coming across any intermediate forms. *R. cruciger* is found in the wet valleys of the hill district around Kandy, but he has not seen it from any other locality. *R. maculatus* has a peculiar fondness for houses; but *R. cruciger*, though found amongst plantain-groves, &c., seems never to enter houses.

2. On some new Species and Genera of Birds of the Family *Dendrocolaptidæ*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received December 19, 1888.]

The following species of the family Dendrocolaptidæ, so far as I can make out, appear to be undescribed. They are based on specimens in the British Museum, and in my own collection and that of Messrs. Salvin and Godman.

1. Upucerthia bridgesi, sp. nov.

Above brown, rump more rufous, head more cinereous; long, narrow superciliaries white; wings blackish, inner primaries and secondaries rufous at the base and edged externally with rufous; tail uniform rufous: beneath dirty white, flanks flammulated with brown; under wing-coverts whitish; inner margins of wing-feathers pale rufous: bill black; lower mandible at the base yellowish; feet blackish. Whole length 7·0 inches, wing 3·1, tail 2·8.

Hab. Bolivia (*Bridges*).

Mus. Brit.

This species comes nearest to *U. montana*, having the whole tail rufous, but the wings and tail are shorter, and the body is much whiter beneath.

2. PHACELLODOMUS RUFIPENNIS, sp. nov.

Above reddish earthy brown; head, rump, wings, and tail brighter, clear rufous; lores whitish; wing-end pale blackish: beneath creamy white; breast slightly washed with rufous, and with bright shaft-stripes; flanks and crissum pale rufous; under wing-coverts dark rufous; bill pale brown, under mandible whiter; feet pale brown. Whole length 8·0 inches, wing 2·7, tail 3·7.

Hab. Bolivia.

Mus. Brit. et P. L. S.

This species has a general resemblance to *P. ruber*, but is distinguished by its earthy-brown back and by the breast being suffused with rufous and marked by very narrow bright shaft-stripes. In *P. ruber* the breast is of a pure white.

It should be remarked that, as I have lately ascertained by examination of the specimens at Paris, the ordinary *Phacellodomus* of the Argentine Republic, which I have hitherto followed Burmeister and others in referring to *P. ruber*, is not *P. ruber*, but *P. striaticollis* (d'Orb. et Lafr.).

3. THRIPOPHAGA FUSCICEPS, sp. nov.

Above earthy brown; head paler, somewhat cinereous; interscapulium washed with rufous; edgings of wings and whole tail chestnut-red: beneath yellowish earthy brown, with very narrow brighter shaft-stripes on the breast; under wing-coverts bright rufous; bill yellowish brown; feet pale brown. Whole length 6·7 inches, wing ·9, tail 3·3.

Hab. Bolivia (*Bridges*).

Mus. Brit.

The earthy-brown cap at once distinguishes this well-marked species from its congeners.

4. PHILYDOR CERVICALIS, sp. nov.

Philydor erythrocercus, Salv. Ibis, 1885, p. 420 (?).

Above uniform dark olive; rump and tail chestnut-red: beneath pale greyish olive; throat white; breast slightly mottled with greyish olive; under wing-coverts and inner edges of remiges bright cinnamomeous; bill greenish grey, with a white blotch on the lower mandible; feet plumbeous. Whole length 6·3 inches, wing 3·1, tail 2·8.

Hab. British Guiana.

Mus. P. L. S.

This species seems to me to be decidedly different from *P. erythrocercus*, although closely allied. It is distinguished by the want of any signs of the superciliary stripe and by the slightly mottled breast. My specimens were obtained at Bartica Grove and at Camacusa in British Guiana by Mr. Whitely.

5. PICOLAPTES PARVIROSTRIS, sp. nov.

Above earthy brown; rump, margins of wing-feathers and tail bright ferruginous; head and neck behind, down to middle of the

back, spotted with well-marked yellowish shaft-spots, which are short and triangular on the head, and long and thin on the neck; the shaft-spots on the head are slightly margined with blackish: beneath earthy brown, densely spotted with elongated ochraceous shaft-spots, which are distinctly edged with blackish; flanks and crissum less marked; chin and middle of throat pale ochraceous, unspotted; bill very short, slightly incurved, pale brown; feet dark. Whole length 8·0, wing 4·0, tail 3·8, bill from gape 0·9.

Hab. S.E. Brazil.

Mus. S.-G.

The single specimen of this species, which was purchased of a dealer, but is of apparently "Brazilian" make, is not unlike some examples of *P. affinis*, but is at once distinguishable by its shortened and straightened bill.

In revising the Dendrocolaptidæ for the 15th volume of the British Museum Catalogue I have found it necessary to use two new generic forms. These are:—

(1) Limnophyes (λίμνη *palus* et φύω *gigno*), for *Limnornis curvirostris*, Gould (Zool. Voy. Beagle, iii. p. 81), a form allied to *Limnornis*, but differing in its curved bill; and

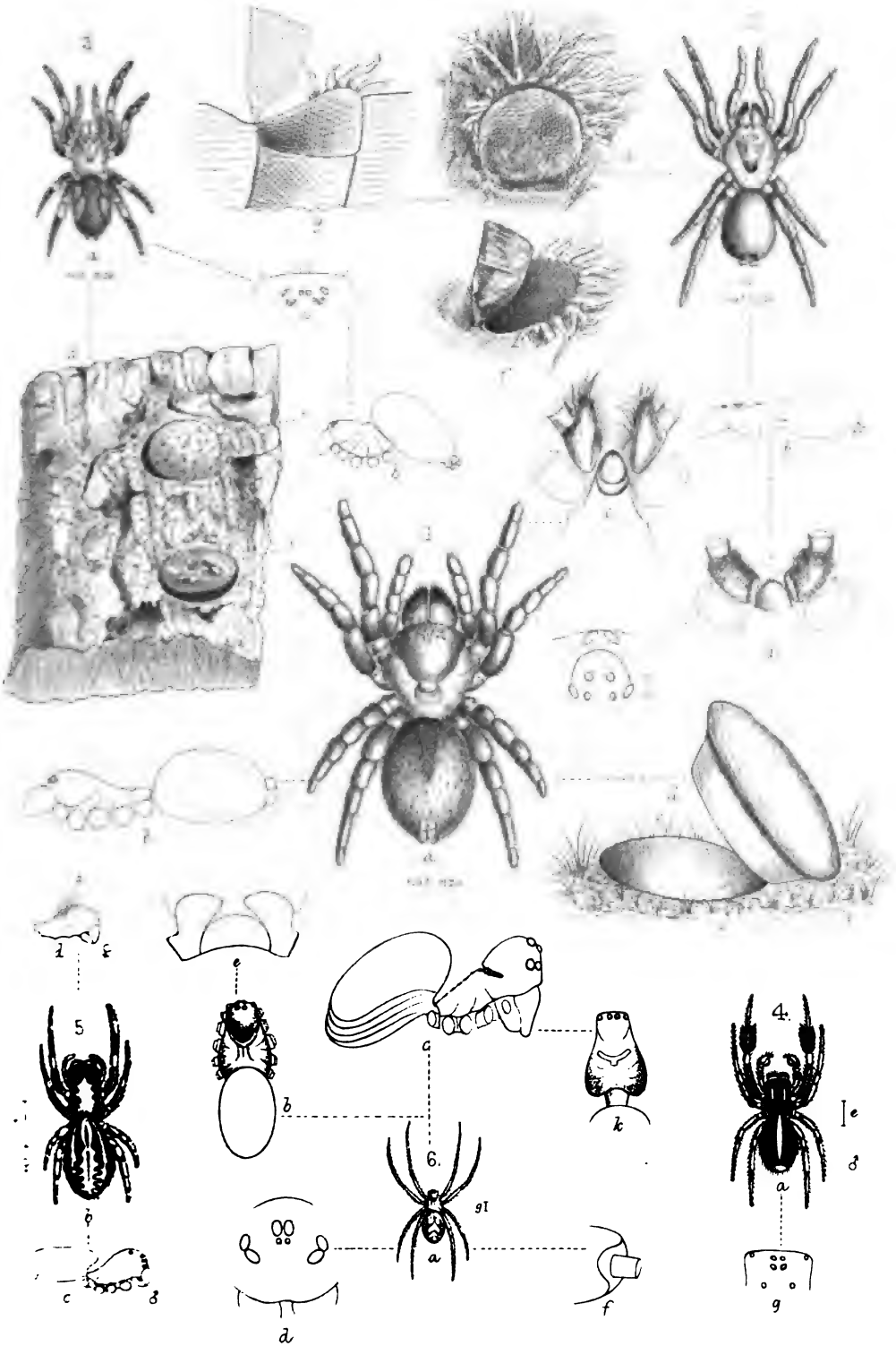
(2) Hylexetastes (ὕλη *silva* et ἐξεταστής *investigator*), for *Dendrocolaptes perroti*, Lafr., which is allied to *Dendrexetastes*, but differs in its much stronger and stouter bill.

3. On some new Species and a new Genus of Araneidea. By the Rev. O. P. Cambridge, M.A., F.R.S., &c.

[Received November 30, 1888.]

(Plate II.)

The Spiders described in the present paper are from the widely separated localities of Burmah, South Africa, and Australia. The principal interest attaching to two of them (from South Africa) arises from their being represented, at this moment, by examples living in this Society's Insect-house. One of these two spiders, *Pachylomerus natalensis*, has been there for the last twelve months along with its fine trapdoor nest. The other, *Stegodyphus gregarius*, has only lately been received there, and is also interesting as being the first, I believe, of this group (*Eresidæ*) whose habits are known to be gregarious: the nest is of large size, and contains from 100 to 150 inhabitants of both sexes and various ages. Some few of these had died on the passage from Durban, and from these the subjoined description has been prepared. Another of the spiders described is interesting as being the second known species of Tree Trapdoor Spiders. The first species was described and figured by myself several years ago (Ann. & Mag. Nat. Hist. xvi. (4) p. 319, pl. x.) from Uitenhage, South Africa, under the name of *Moggridgea dyeri*. Subsequently in 1887 a note was communicated to



NEW SPIDERS.

this Society by Dr. Günther (P. Z. S. 1887, p. 40), from the Rev. Nendick Abraham, of Grahamstown, on what Dr. Günther supposed to be the same species as that described from Uitenhage. Wishing, however, to be assured of this, I wrote to Mr. Abraham asking him to send me, if he could procure them, examples of the species to which his note referred. This Mr. A. has very kindly and promptly done, sending me several nests with the spiders belonging to them. Among these I have found two examples of *Moggridgea dyeri*, and two others of quite a different, though allied species, to which I have given below the name of *M. abrahami* after its very painstaking discoverer. One of the spiders described here is remarkable, not only for its minuteness, being no more than half a line in length, but for the peculiar character of its cephalothorax, in which the ordinary indented lines showing the junction of the caput and thorax are replaced by two deep oblique converging fissures, necessitating, along with other characters, the formation of a new genus in the family *Theridiidæ* for its reception. This specimen has been in my possession for many years past, but had until lately been overlooked owing to its having been accidentally concealed among the hairs on one of the legs of a large spider received in 1864 from the Swan River.

Other particulars respecting the spiders described below will be found appended to their scientific description. With that of one of them I have incorporated a long, but very interesting account of the nest of the spider *Idiops colletti*, which was sent to me from Burmah by General Collett, through the kindness of Mr. George King, of the Botanic Gardens, Calcutta. This is, so far as I know, the first detailed account of the nest of a spider of this group, though I had myself many years ago found one species of it near Beirût in a trapdoor nest, which was, however, unfortunately destroyed on the way home, before any note could be taken of its nature and peculiarities.

Order ARANEIDEA.

Family THERAPHOSIDÆ.

Genus PACHYLOMERUS, Auss.

PACHYLOMERUS NATALENSIS, sp. n. (Plate II. fig. 1.)

Adult female. Length 1 inch 5 lines, length of cephalothorax 6½ lines, breadth at the widest part 6 lines.

Cephalothorax a little longer than broad, the fore extremity wider than the posterior, the widest part is across the middle. The caput is large, rounded and convex above, the occiput sloping in a gradual curve to the thoracic indentation, which is large, deep, semilunar, with the convexity of its curve directed backwards, and situated exactly one third of the length from the hinder extremity of the cephalothorax. The cephalothorax is smooth, glossy, and of a rich reddish chocolate-brown colour, rather paler at the hinder extremity and in the ocular region.

The *eyes* are rather small and form a transverse oblong area, the

height of the clypeus being half that of the facial space. The fore central pair of eyes are separated from each other by 2 diameters' interval and from the fore laterals by $1\frac{1}{2}$ diameters; the latter are largest of the eight, and (looked at from in front) form a curved row whose convexity is directed upwards; the hind lateral and hind central eye, on each side, are contiguous to each other in a transverse line, the four forming the ends of a very nearly straight row, rather longer than anterior row, the hind centrals being the largest. The centre of the ocular area, and reaching to a little way behind it, is furnished with strong bristly hairs directed forward.

The *legs* are short, very strong, 4, 1, 3, 2, similar in colour to the cephalothorax, furnished with hairs, and numerous short strong spines near the sides of the tarsi and metatarsi of the first and second pairs; these spines, however, are very difficult to see, owing to the density of the hairs on those parts; there is, however, no scopula, and the superior tarsal claws are (apparently) devoid of denticulations.

The *falces* are massive and about $\frac{2}{3}$ of the length of the caput. They are similar in colour to the cephalothorax and densely clothed with short hairs excepting a large patch near the base in front, and near their extremities are numerous short tooth-like spines.

The *palpi* are similar in colour and armature to the anterior legs.

The *maxillæ* are strong, subcylindrical, with a strong prominent conical point at the extremity on the inner side; at the base on the inner side of each maxilla is a short curved row of several dentiform spines similar to some others at the apex of the labium.

The *labium* is small, about equal in length and breadth at the base, which is transversely curved, the convexity of the curve directed backwards; the base fits into a corresponding hollow in the sternum on a kind of inverted subconical base marked in the sternum by a distinct indentation. It is roundish-pointed at the apex, where there are five short dentiform black spines.

The *sternum* is large, triangular, a little broader at the base or hinder end than long; the base, however, being rather angulate, and not rectilinear. It is similar in colour to the thorax, the labium being of a deeper hue.

The *abdomen* is short-oval, very convex, of a mouse-colour, clothed with very short hairs. The spinners are short; the superior pair strong, and 3-jointed; the inferior pair are much smaller and consist of one joint only. A little way in front of the inferior spinners are two small transverse slits or openings, doubtless the orifices of tracheal organs.

Two of these spiders, received from Natal along with their trap-door nests, lived for some time in the Gardens of this Society; one is still living there; the other died, and its remains, from which the above description has been made, were sent to me by Mr. Arthur Thomson along with a rough sketch of the upper part of the nest, the lid of which (of the *cork* type) can just be covered with a penny-piece.

Genus Idiops, Perty.

Idiops colletti, sp. n. (Plate II. fig. 2.)

Adult female. Length 10½ lines; length of cephalothorax 4¾ lines; breadth of cephalothorax, at widest part, 3¾.

Cephalothorax longer than broad, the fore and hinder extremities equal in breadth; thoracic indentation large, deep, curved, the convexity of the curve directed backwards; the occiput is very convex. The colour of the cephalothorax is pale yellow-brown, clothed with a few hairs, and two longish, erect, tapering bristles placed transversely just in front of the occipital convexity.

The *eyes* of the anterior pair are close to the fore margin of the cephalothorax, rather large, and largest of the eight, oval, placed obliquely and separated from each other by less than half the longest diameter; from between these two eyes spring one or two longish prominent black bristles. The four central eyes of the posterior group, which is separated from the anterior pair by nearly about double its longitudinal diameter, form a square, the foremost eyes being smallest; those of the posterior row, which are of about equal size, form a moderately curved transverse line whose convexity is directed backwards. The interval between the two central eyes of this row is distinctly greater than that which separates each from the lateral eye next to it; this latter interval is as nearly as possible equal to an eye's diameter. The ocular area forms (roughly) an equilateral triangle.

The *legs* are short, stout, 4, 1, 2, 3; those of the third and fourth pairs considerably stoutest, furnished with hairs and spines; the latter are of different lengths and strength, many being small and of a denticulate nature, and are chiefly on each side of the tibiæ, metatarsi, and tarsi of the two anterior pairs; those on the third pair are chiefly on the upperside of the genuæ, tibiæ, metatarsi, and tarsi, while on the fourth pair the spines are few and those mostly beneath the metatarsi and tarsi.

The *palpi* are similar in colour to the legs, and armed as those of the first and second pairs.

The *falces* are moderate in length and strength, of a darker hue than the cephalothorax, and armed with numerous strong short spines near the inner side of their fore extremity.

Maxillæ cylindrical and thickly covered on their anterior sides with small denticulations or spines.

Labium somewhat quadrangular, broad at the base (broader than long), narrower at the apex, where there are a few small spinous denticulations, chiefly in a transverse row close to the margin.

Sternum broadest behind, and longer than broad, incurved at its fore extremity, similar in colour to the cephalothorax.

Abdomen dull clay-colour, thinly clothed with fine hairs of different lengths. Spinners 4, those of the superior pair short, 3-jointed, but very strong; the inferior pair very small and close beneath the base of the upper ones.

Two adult females of this spider were received from General

Collett from near Meiktela, Upper Burmah, through the kindness of Mr. George King (of the Botanic Gardens at Calcutta). They are closely allied to *Idiops crassus*, Sim. (also a Burmese spider); but differ in being of a much paler hue, as well as (apparently) in the relative disposition of the eyes and armature of the legs; these in *Idiops crassus* are said to be armed with spines as in *Idiops syriacus*, Cambr., in which the smaller denticulate spines are almost wholly absent. From *Idiops syriacus* the present species also differs in being larger and of a duller hue; also the *denticulæ* on the maxillæ are confined to their inner side, and there are only two in a transverse line at the apex of the labium. The eyes also of the hind central pair in *I. syriacus* are separated by a comparatively wider interval than in *I. colletti*, being double as far apart as each is from the lateral eye on its side.

Nests of these spiders accompanied them. They are of the *cork*-lid type, and present some interesting features. I cannot perhaps do better than append the very graphic account of them given by General Collett:—

"These spiders are apparently more or less gregarious in their habitations; where one is found five or six more will perhaps be found within the radius of a yard; but a solitary nest is not at all unusual.

"The soil they inhabit is a stiff argillaceous (?) sand, quite free of stones, very hard at this time of year, though probably soft and easy for the spiders to burrow in during the rainy season.

"The surface of the ground in which the burrows are found is usually thinly covered with a scanty growth of grass, now dry and withered. Where the grass is thick the burrows are not so common, but this is possibly due to the increased difficulty of detecting them.

"All the burrows that I have seen (a hundred or more) are situated in an open grassy plain, now cleared, but recently covered with a low scrub jungle, and having a gentle slope. None have been found on banks or on steeply sloping ground.

"The upper surface of the burrow door is flush with the level of the ground, except occasionally where the superficial soil appears to have been washed away by the rain since the nest was made. It is of precisely the same appearance and colour as the adjacent ground, and the burrows are therefore extremely difficult of detection.

"I have never observed any accumulation of earth near the mouths of the burrows, though a considerable quantity must have been excavated in the construction of a hole more than half an inch in diameter and seven inches deep. Nor have I succeeded in finding any burrows in course of construction, though empty and disused burrows with displaced doors are not uncommon. It is possible that the spiders excavate only during the rainy season, when the soil is soft. At the present time no rain has fallen for three months past.

"The door, or rather lid, of the burrow is composed of grains of sand firmly agglutinated together, perhaps with some secretions from the insect; its upper surface is exactly similar in general appearance to the adjacent ground, and is often covered with the dry, black

lichen (?) growth that is common on dry soils at this time of year. As seen from above, the door is a square, with its two anterior angles rounded off, the straight side or base forming the hinge-end. But if the door is opened and viewed from below, it has a circular appearance, reminding one of a gun-wad, which is due to its white lining having been worked into a circular form to fit the mouth of the cylindrical burrow. In cross section the door is conical, like a plug, with its lower surface convex, like the bottom of a decanter-stopper. This surface is beautifully worked over with a network of fine, tough fibres, into which the spider (as I have seen) inserts its claws to keep the door closed against the entrance of an enemy. In no other part of the burrow-lining is this network of fibres to be seen. The door is always made thin at the hinge-end, and thick at the forward end, the average respective thicknesses being one sixteenth of an inch and one quarter of an inch; so that its section is wedge-like. The result of this construction is that the door will always on release after being opened fall down by its own weight, fitting with exceeding and surprising accuracy into the mouth of the burrow. So preponderating is the weight of the door at its forward end, and so instantaneously does the action of gravity cause it to fall when released after being held up, that the shutting of the door closely simulates the action of a spring, and it is very difficult at first sight to realize that no elastic force exists in the action. Thus, when a spider sitting at the mouth of its hole, with the door ajar, resting on its back, darts down its burrow when startled, the door seems to snap down with the action of a suddenly released spring; but that this is really caused by gravity anyone may convince himself by cutting the mouth of a burrow out of the ground, and noticing the action of the door and its hinge when held upside down.

"The hinge, which is beautifully flexible, is formed by a prolongation and local thickening of the lining of the burrow, which is also carried over the lower surface and round the edges of the door. The part of the lining forming the hinge is thick and tough, and of the same colour outside as the ground, but there is nothing special or mechanical in its structure as a hinge. It may be mentioned here that the lining of the tube is thinned off at the mouth of the burrow to receive the door, a distinct rim being usually observable at the commencement of the burrow proper. There are generally a few withered grass-blades worked into the edge of the door, or into the edge of the mouth of the burrow, so as to form a kind of semi-circular fringe, which often catches a practiced eye and leads to the detection of the hole. The grass-blades are probably inserted to aid in assimilating the outside of the burrow to its surroundings, a purpose in which they certainly fail, so far as the human animal is concerned. In a few cases I have also noticed grass-blades worked into the general surface of the door, and at this season, when the grass is everywhere withered, these certainly aid in its concealment; but during the rains, when the adjacent grass is green, one would think that yellow withered grass-blades on or near the burrow-mouth would tend to make it conspicuous.

"The spiders are occasionally found, even in the daytime, watching at the mouths of their holes, but they prey on insects, I suspect, chiefly at night. At least a few burrows which I marked and visited about 10 P.M. had, in nearly every instance, their tenants sitting at the mouth, with the door more or less open, apparently on the watch for unwary insects passing by. In one case the door was elevated about 60°, the others not so much. When disturbed in her watch the spider slips quickly down the hole, and the door closes after her. If the door is now attempted to be lifted by the point of a penknife, the spider will hold it down with very considerable force, and can be plainly felt struggling to prevent its forcible opening. If the spider is not at the mouth of her hole, it is easy to ascertain if she is at home by scratching the outside of the door, when, if present, she will always rush up the burrow, and try to the best of her ability to hold down the door. The doors are all constructed on the same general plan, but they vary slightly in size and thickness. The following are the mean dimensions of five doors taken at random, the measurements, as before, being given in eighths of an inch and decimal parts thereof:—

"Breadth of hinge-joint	5·12
Thickness of door at the *forward* end	2·04
Transverse diameter of door	5·12
Diameter of door from hinge to forward end	5·14

"We may thus say that an average door is a square of five eighths of an inch, and with a thickness at its forward or rounded end of a quarter of an inch. The thickness at the hinge-end is about one sixteenth of an inch, rather less if anything.

"The length of the burrow from the mouth to the bottom may be taken as seven inches. I measured the burrows accurately, the longest was $7\frac{5}{8}$ inches, and the shortest was $6\frac{3}{4}$ inches; the mean of the ten holes was $6\frac{7}{8}$ inches. The burrows are cylindrical, and usually nearly straight, with a slight incline from the vertical towards the side on which the hinge is placed. They are lined throughout, the lining being thicker near the mouth and at the bottom, the two places where, I suppose, the spider usually sits. The diameter of the burrow remains nearly uniform throughout, at five eighths of an inch, with a very slight enlargement at the bottom. I have never found a burrow with an elbow or decided turn in it, or with a branch. The burrow is always, so far as my experience goes, a simple and nearly straight hole."

"Pyawbwe, Upper Burmah,
"January 7, 1888."

The *planting* (as it were) of the lids of the nests with lichens, causing them to resemble most exactly the surrounding surface, is similar to that observed by the late Mr. Moggridge in respect of the *Nemesias* of the Riviera, and is indeed a very remarkable habit; the edges of the door are in the case of the present species furnished also with bits of grass resembling those growing around the nests.

The figures of the nest (Plate II. fig. 2, *e*, *f*, *g*) were drawn by Lieut. Pink, of the Queen's Regiment.

Genus MOGGRIDGEA, Cambr.

MOGGRIDGEA ABRAHAMI, sp. n. (Plate II. fig. 3.)

Adult female. Length 6½ to 7 lines; length of cephalothorax 2½ to 3 lines; breadth slightly over 1½ to slightly over 2 lines.

Cephalothorax oval, slightly truncate at its hinder extremity, more broadly truncated at its anterior margin. Thoracic indentation rather nearer the posterior than the anterior margin, well marked and deep, semicircular, the convexity of the curve directed forwards, and its posterior margin rather gibbous. Caput well defined, but not elevated. The height of the clypeus equals half that of the facial space. The colour of the cephalothorax is dull yellowish brown.

The *eyes* (looked at from above and very slightly behind) form two slightly curved transverse rows, the convexity of the curve directed forwards; looked at from above and in front the anterior row might be said to be straight. The fore central pair are separated from each other by an eye's interval; the laterals of the same row are largest of the eight, oval, oblique, and each is separated from the central eye on its side by rather more than the length of its longest diameter. The posterior row is shorter than the anterior, its lateral eyes are each removed from the fore lateral eye next to it by an eye's diameter (in one example rather less than a diameter); the hind centrals are each very near, but not quite contiguous, to the hind lateral on its side, and the two (hind lateral and central) are placed strongly obliquely and almost in a straight line with the fore-central on their side.

The *legs* are short, strong, 4, 1, 2, 3, though there is but very slight difference between 1, 2, and 3. They are of a yellowish hue, the femora and tibiæ (as also the tarsi and metatarsi of the first and second pairs) more or less suffused with blackish brown. The *tibiæ*, tarsi, and metatarsi of the first two pairs are armed on each side with a row of strong spines of different lengths. The superior pair of tarsal claws are furnished beneath with one or two small denticulations.

The *palpi* are similar to the legs in colour and armature.

The *falces* are powerful, but not remarkable in form or strength, and are similar in colour to the cephalothorax.

The *maxillæ* are subcylindric, with only a slight, obtuse, prominent point at their inner extremity; their surface on the inner side is furnished with some small, deep red-brown, spinous denticulations.

The *labium* is short, rather broader than long, its apex rounded and a little narrower than the base. The surface near the apex is furnished with denticulations similar to those on the maxillæ.

The *sternum* (with the maxillæ and labium) is of the same colour as the legs, and of an equilateral subtriangular form.

The *abdomen* is large, short-oval, very convex above, clothed with fine hairs, and of a dark purplish chocolate-brown hue; on the sides

are two large, somewhat suffused, pale yellowish patches; the underside is also paler than the upper; spinners short, superior pair 3-jointed, yellow, tinged with brown, inferior pair small, 1-jointed, and yellow.

Examples of this spider, with two of its curious trapdoor nests found in the bark of the "Kaffir Boom" tree, were kindly sent to me lately by the Rev. Nendick Abraham. It is nearly allied to, but quite distinct from, *Moggridgea dyeri*, Cambr. (Ann. & Mag. Nat. Hist., Nov. 1875, p. 317, pl. x.).

Among other differences, it is a larger paler-coloured spider, the two rows of eyes are much closer together, and the hind lateral eyes are smaller in proportion to the hind central. The denticulations on the maxillæ and labium are much less strong, and are not found (as in *M. dyeri*) beneath the bases of the coxal joints of the first three pairs of legs. The nest resembles in general that of *M. dyeri*; it is, however, even better concealed than those of that species, there being no abnormal prominence, and often not the slightest tubular convexity of any kind apparent. In fact I had to search very minutely for ten minutes, and test every part of the pieces of bark sent to me with the point of a needle, to find out the lids of the nests. One of the nests is furnished with a lid at each end; and from a communication made by Mr. Abraham to Mr. F. Taylor, of Liverpool, I gather that this is also occasionally the case with the nests of *Moggridgea dyeri*. I came to the conclusion, from Mr. Abraham's letter to me, that this latter spider was peculiar to the "Kaffir Boom," and the present species to the Oak; but his notes on the two, sent to Mr. Taylor, lead me to suppose that each is found on both trees. The skill and perfection with which the minute lichens are placed upon the tube and its lid, causing them to resemble most exactly the rest of the bark, is indeed wonderful. Of the nests I have yet seen that of *M. dyeri* is less well concealed than those of *M. abrahami*.

Examples both of the spiders and nests of *M. dyeri* were also sent to me by Mr. Abraham, whose name I have much pleasure in connecting with the new species.

It is not easy to conjecture the purpose of the lower door. Mr. Abraham suggests that the lower door is made when the spider is young and gaining its experience, as a mode of escape from enemies which might gain access to the upper door. He has found that the lower door "is not generally (if ever) so perfect as the upper door." In the specimens before me, however, I can detect no difference between the two as regards perfection.

Family Eresidæ.

Genus Stegodyphus, Sim.

(*Eresus*, auctt. in parte.)

Stegodyphus gregarius, sp. n. (Plate II. figs. 4, 5.)

Adult female. Length 2½–4 lines; length of cephalothorax in a

specimen of 3 lines long, 1½ lines; breadth of cephalothorax rather over 1 line.

Adult male. Length 1¾ lines.

The sexes are very dissimilar in appearance. In the *female* the cephalothorax is oblong, caput very large, hinder slope abrupt, upper surface moderately convex; the ocular area occupies at least one third of the whole length of the cephalothorax, and the height of the clypeus is scarcely equal to the length of the area of the four central eyes. The colour is yellow-brown, with a broad dark brown longitudinal band on each side. The whole is clothed with coarsish grey hairs, showing most conspicuously on the lateral margins, on the central space between the dark lateral bands, being especially long and conspicuous at the thoracic junction, and forming some white lines connecting the eyes and bisecting the area of the four central ones.

The *eyes* form a very large quadrangle, whose posterior side is the shortest and its anterior much the longest. They are small, the posterior eyes of the central group largest, the rest apparently nearly equal. Those of the central group are close together at the fore extremity of the quadrangle, but not contiguous, forming a small square or trapezoid, whose anterior side is shorter than the posterior. The interval between the eyes of these two sides respectively is greater than a diameter, while the interval between each anterior and the posterior eye next to it is less than the diameter of an anterior eye.

The *legs* are strong and of moderate length, 1, 4, 2, 3, of a yellow-brown colour; the femora, as well as the tibiæ of the first and second pairs, nearly black; in some examples the legs have a somewhat annulose appearance. They are almost entirely destitute of spines, but thickly clothed with hairs, of which many are grey, giving them a hoary look. The tibiæ of the first two pairs are rather stouter than the rest, and the metatarsi of the first pair, in old females, are of a brightish red hue, those of the second pair less so. Towards the inner side of the metatarsi of the fourth pair is a calamistrum running the whole length of the joint, but much concealed by the other hairs.

Falces strong, of moderate length, vertical, subconical, darker in colour than the cephalothorax, and clothed with grey hairs, a band across the base in front being more dense and conspicuously white. The fangs are bright red-brown, but rather weak.

The *maxillæ*, *labium*, and *sternum* are deep brown, clothed with grey hairs, and of normal form.

The *abdomen* is oval, a little broader in some examples behind than in front; its general colour is more or less bright warm yellow-brown, clothed with grey and other hairs; on the upperside are three longitudinal, more or less well-defined dark brown stripes, of which the central one is the narrowest and least conspicuous, and the lateral ones are often dentated posteriorly. The lateral margins and sides also are dark black-brown, and on the underside are two conspicuous reddish-yellow-brown patches, placed transversely and

clothed with grey hairs. The spinners are short, and in front of the ordinary ones is a transverse spinning-organ, always found correlated with the calamistrum on the fourth pair of legs.

The *male*, besides being very much smaller than the female, has the cephalothorax of a very deep black-brown hue, with a marginal stripe on each side and in front of white hairs, and a narrow longitudinal stripe of the same kind bisecting the ocular area, and a few other white hairs near the posterior eyes and on the occiput. The *legs* are longer than in the female, especially those of the first pair; they are of a bright orange-red colour, the femora and tibiæ of the first pair suffused with blackish, the tibiæ rather enlarged and thickly clothed with long black hairs; besides other hairs all the legs are furnished more or less with some white ones on their upper side. The *abdomen* is of a deep black-brown hue, with a pale yellow-brown longitudinal central tapering stripe, clothed with white hairs, and reaching a transverse bar of the same kind just above the spinners; and on the underside are two oblique, elongate pale spots or patches similarly clothed, and placed transversely near the spiracular plates. The *palpi* are short and of a black-brown hue; the radial joint is shorter than the cubital; this latter joint has a fore margin of conspicuous white hairs; digital joint rather large, and its fore extremity drawn out. The palpal organs are simple, consisting of a roundish basal bulb, with a somewhat twisted paler process at its anterior side reaching not quite to the end of the digital joint. The *sternum* is black, clothed with coarse pale grey hairs.

A nest of this spider containing numerous live individuals of both sexes, some adult, some immature, was sent a short time ago by Col. Bowker, from Durban, to Lord Walsingham, who, kindly acting on my suggestion, sent the whole to this Society's Gardens, where, as I understand from Mr. Arthur Thomson, in whose care they are placed, the whole family are in a very active and thriving state. The nest is of considerable size, and filled a box of 2 feet long by 9 inches wide and 5 deep. Above this nest I hear that the spiders have now spun lines up to the top of the case in which they have been placed, as though for the ensnaring of flies, &c.; but as their work is entirely nocturnal, no observations have yet been practicable in respect to this most interesting part of a spider's economy. They appear to devour cockroaches and crickets, tearing them to pieces in concert, and each carrying off his share of the prey, like a pack of hounds breaking up a fox.

This spider is allied to *Stegodyphus acanthophilus*, Dufour, of Southern Europe, Palestine, and Syria, but is smaller, differs greatly in colour and markings, and is, so far as I am aware, unique in its gregarious habits. Some of the examples had died during the long transit from Durban to England, and from these the descriptions have been made.

Family Theridiidæ.

Gen. nov. Chasmocephalon.

Cephalothorax short-oval; caput large and very convex above; the ordinary oblique indentations dividing it from the thorax are greatly exaggerated, forming a deep chasm or cleft on each side. The posterior extremity of the thorax is broad and strongly indented or excavated in a curved form, forming a kind of socket into which the pedicle joining it to the abdomen fits.

Eyes of very unequal size; in three well separated groups occupying the whole width of the fore part of the caput; the anterior pair of the central group smallest, the rest nearly equal. The clypeus considerably exceeds in height half that of the facial space, occupying about, or even more than, two thirds of it.

Legs slender, moderately long, 1, 4, 2, 3; furnished with hairs and bristles only.

The *maxillæ* are short, curved, inclined towards the labium, and somewhat pointed at their extremities on the inner side.

Labium short, broad, and round at the apex, which reaches nearly to the extremities of the maxillæ.

Abdomen considerably elevated in front and projecting greatly over the base of the thorax, with which it is connected by a distinct pedicle, the abdomen having also a kind of socket or excavation to receive it. Besides the usual spiracular openings there is a long transverse one beneath the abdomen just in front of the spinners.

Chasmocephalon neglectum, sp. n. (Plate II. fig. 6.)

Adult male. Length scarcely over half a line.

The surface of the *cephalothorax*, which is of a clear bright brownish-red hue, is granulose; the oblique cephalic indentations are deep and sharply cut, looking as if they would sever the caput from the thorax; the other normal (thoracic) grooves are also of somewhat the same nature, though very much less strong; the posterior end of the thorax is broad and deeply excavated; the hinder part of the caput is well rounded, the fore part flatter.

The *eyes* of the central group form a trapezoid whose anterior side is much the shortest; the pair of eyes composing this side are very minute and contiguous to each other. The posterior pair are oval, large, contiguous, and of a pearly hue, their diameter equalling more than double that of the anterior pair; each of these is separated from the anterior eye opposite to it by an interval only about equal to the diameter of the latter. The hind lateral eye on each side is separated from the hind central next to it by about $1\frac{1}{2}$ diameters of the former, and each fore lateral eye, which appears to be rather the largest of the eight, is contiguous to its hind lateral eye. The lateral eyes are also pearly, the fore centrals being a little darker.

The *legs* are dull orange-yellow; the hairs longish, but not very numerous, and there are also a few prominent bristles.

The *palpi* are unfortunately missing.

Falces moderately strong, rather long, straight, and a little inclined

backwards. They are similar to the cephalothorax in colour, and their surface is slightly granulose.

The colour of the maxillæ and labium is similar to that of the falces.

The *sternum* (which is nearly round) is of a deeper hue than the cephalothorax, convex and granulose.

The *abdomen* is rather large, oval, but projects greatly over the thorax; the short, but distinct pedicle connecting it with the thorax entering the abdomen about midway between the most elevated point and the spinners. The upper surface is shining glabrous, furnished with a very few bristly hairs, of a dull clay-yellow, marked rather irregularly towards the sides and hinder part with dull brownish; the lower portion of the sides and hinder part are rather darker and strongly rugulose, giving the upper surface very much the appearance of a shell or carapace, whose edge is margined by a row of round, small, dull yellowish, somewhat cicatricose spots, of which there are also two others, more conspicuous or wide apart, in a transverse line on the hinder part of the carapace. The spinners are small, apparently of ordinary structure, and inconspicuous. The underside is dark brown, and at the fore extremity is a rather large and somewhat quadrate coriaceous red-brown area, at the posterior edges of which, at the outer corners, are the ordinary spiracular openings, though scarcely traceable. Just in front of the spinners, beneath the abdomen, is a long well-marked transverse fissure, which is doubtless the entrance to another spiracular organ.

Many years ago (1864) I received a large spider from the Swan River, and described and figured it, but until a day or two since have never had occasion again to look at it. Examining it, however, now closely, I found on the inner side of one of the folded legs, among its numerous hairs, the very minute spider (thus till now wholly overlooked) which forms the type of the present new genus and species.

EXPLANATION OF PLATE II.

Fig. 1. *Pachylomerus natalensis*, sp. n., ♀ (p. 35).

a, Spider of natural size; *b*, profile, without legs &c.; *c*, maxillæ, labium, and portion of sternum; *d*, entrance to trap-door nest.

2. *Idiops colletti*, sp. n., ♀ (p. 37).

a, Spider, natural size; *b*, profile, without legs &c.; *c*, eyes, from above and behind; *d*, maxillæ and labium; *e*, entrance to nest; *f*, ditto, with trap-door raised; *g*, section of upper part of nest.

3. *Moggridgea abrahami*, sp. n., ♀ (p. 41).

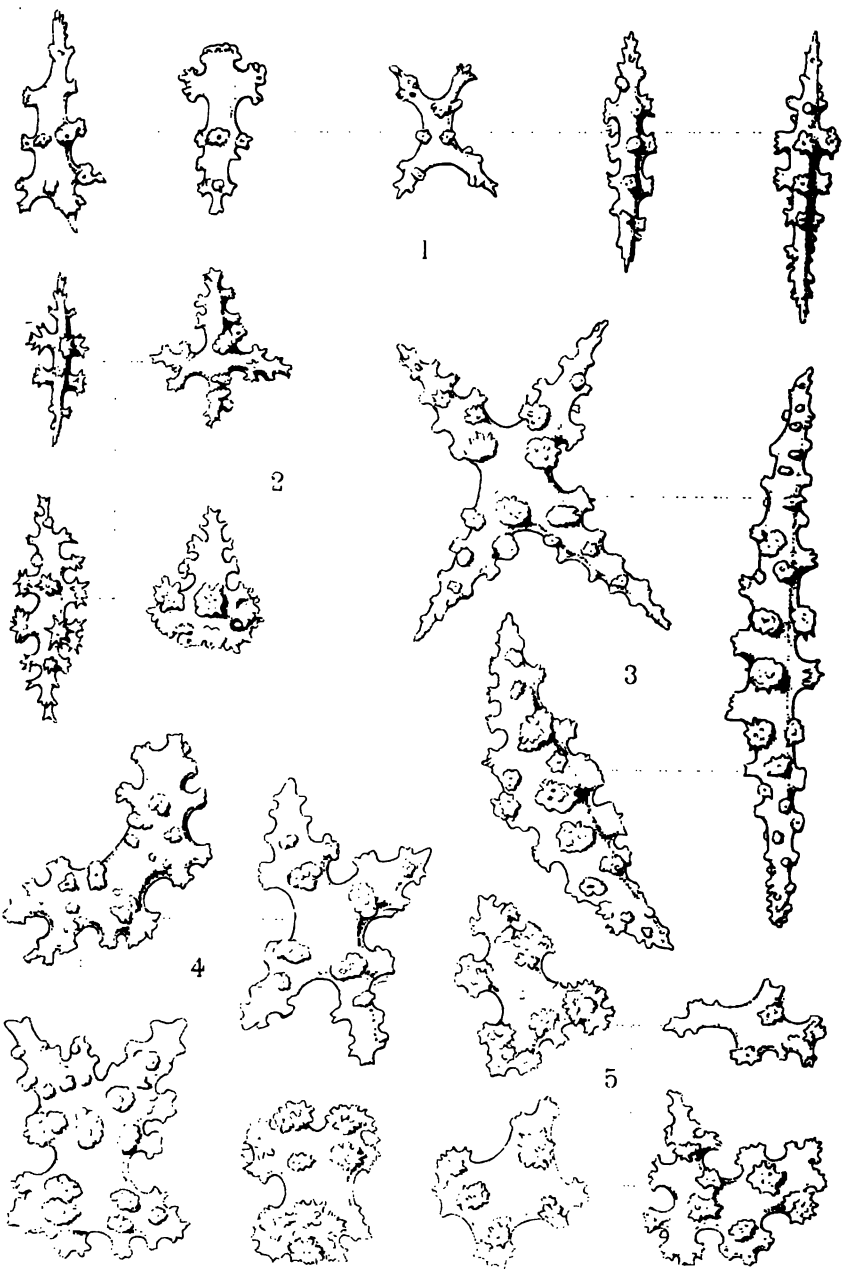
a, Spider, natural size; *b*, profile, without legs &c.; *c*, eyes, from above and behind; *d*, portion of bark of "Kaffir Boom" tree, with nest, showing (1) upper hinged lid, (1′) lower ditto, both slightly open.

4, 5. *Stegodyphus gregarius*, sp. n., ♂ and ♀ (p. 42).

a, ♂, enlarged; *b*, ♀, ditto; *c*, profile of ♂; *d*, ditto of ♀, showing long hairs at *x*; *e*, natural length of ♂; *f*, natural length of ♀; *g*, eyes, from above and behind.

6. *Chasmocephalon neglectum*, sp. n. ♂ (p. 45).

a, Spider, enlarged; *b*, outline of cephalothorax and abdomen; *c*, profile of ditto; *d*, eyes from in front; *e*, maxillæ and labium; *f*, hinder extremity of thorax, showing excavation and insertion of abdominal pedicle; *g*, natural length of spider; *h*, cephalothorax, showing form of hinder part of thorax.



Imp. Camb. Sci. Inst. Jr.

SPICULES OF PLEXAURIDÆ

The present species is erect, branching, elegant, not at all closely bushy; there is no spreading base, but the trunk is rather wide, being about 3 cm. in diameter; the branches are flattened at the points of bifurcation; the secondary trunks give rise to branches, which do not ordinarily branch more than five times, so that many of the terminal twigs are as much as 35 cm. long; these terminal twigs are about 5 mm. in diameter. There are a few nodosities. The cortex is fairly thick, the calyces numerous, irregularly scattered, rather large pits, so that the general appearance is not unlike that of *P. porosa*. Axis brownish, impregnated with calcareous salts, and the species belongs, therefore, to the genus *Plexaurella* and not to *Plexaura*. The characteristic spiculation is shown in the accompanying figure.

Hab. West Indies.

5. PLEXAURELLA VERMICULATA. (Plate III. fig. 5.)

Gorgonia vermiculata, Lamk.

Plexaura vermiculata, Val.; see Milne-Edwards & Haime, Corall. i. p. 156.

Plexaurella vermiculata, Kölliker, Icon. Histiol. p. 138.

There is not, I think, sufficient reason for distinguishing as the type of a distinct species a specimen labelled by Dr. Gray as *Plexaura porosa*, but which is certainly a *Plexaurella*, inasmuch as it has deposit of calcic carbonate in its axis. It presents some slight points of difference from *P. vermiculata*, as described by Milne-Edwards and Haime, and there is not an absolute identity of spiculation. There cannot, I think, be any doubt that there has been a tendency to neglect the variations possible in these forms, and it is better to refrain from "splitting" species.

In the specimen under consideration the calices are nearly as closely packed as in *P. porosa*; the terminal branches are often rather less than 8 mm. in diameter, and the main trunks are from 12 to 16 mm. across, whereas Milne-Edwards gives 8 mm. for the former and 9 to 10 mm. for the latter; no statement, however, is made as to the height of the whole mass; in the case of the British Museum specimen it is rather more than 60 cm. and all the tops are a little broken off.

The cortex, which is thick, is of a lightish brown colour; the axis is of a light brown colour. The axis is flattened at the angles of division, and there appears to be no tendency to the formation of nodes; some of the terminal branches are more than 15 cm. long.

The spicules are, as the figures show, short, but somewhat irregular in form.

EXPLANATION OF PLATE III.

Spicules of *Plexaura* and *Plexaurella*, × 180.

Fig. 1. *Plexaura principalis*, p. 47.
2. *Plexaura suffruticosa*, p. 48.
3. *Plexaurella affinis*, p. 48.
4. *Plexaurella anguiculoides*, p. 48.
5. *Plexaurella vermiculata*, p. 49.

5. Notice of two Fishes new to the British Fauna. By Dr. A. Günther, F.R.S.

[Received February 5, 1889.]

(Plate IV.)

1. *On a Hybrid between the Roach* (Leuciscus rutilus) *and the Bleak* (Alburnus alburnus).

In December of last year I received from Lord Lilford a Cyprinoid 5½ inches long which had been caught in the river Nene in Northamptonshire, close to Lilford, and which he rightly supposed to be a hybrid between the Roach and the Bleak. So far as I know, hybridism between these two genera has not been observed hitherto, and occurrences of this form must be also scarce in the river mentioned, although other hybrids, as between the Bream and White Bream, between the Bream and Roach, between the Bream and Rudd, are by no means scarce, and, as Lord Lilford informs me, are on the increase.

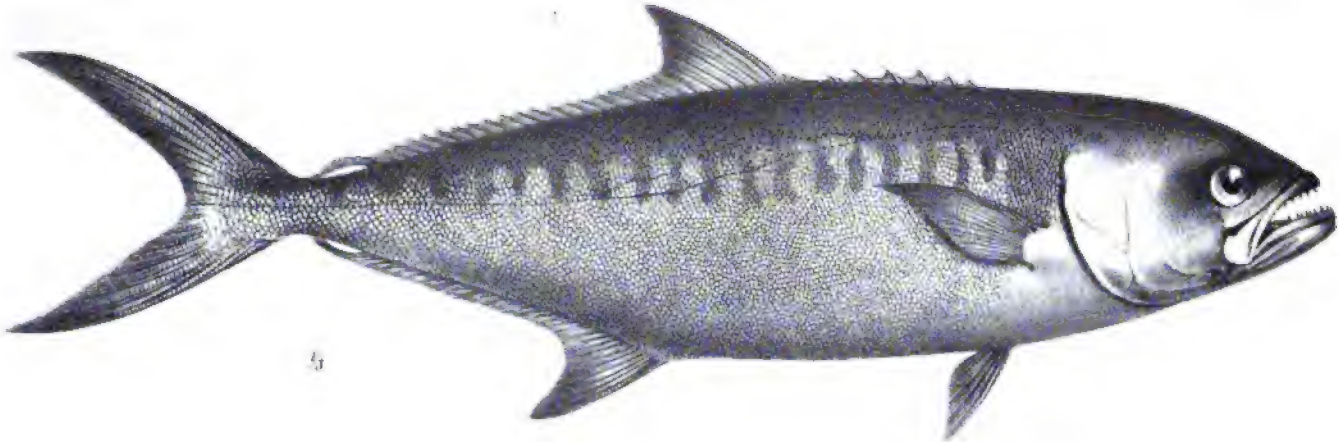
The specimen is singularly intermediate between the two parent forms, as will appear from the following description :—

The body is somewhat elevated, its depth being two sevenths of the total length, without caudal (*rut.*); the abdomen compressed into a ridge between the ventral fins and the vent, the posterior scales not crossing to the other side of the ridge (*alb.*). The head is small, contained 4⅓ times in the total length, without caudal (*alb.*); snout short, rather shorter than the eye (*rut.*), but with the lower jaw distinctly projecting (*alb.*). Pharyngeal teeth in a single series (*rut.*, *alb.*); gill-rakers very short (*rut.*). Lateral line running distinctly below the median line of the tail (*alb.*), formed by 44 scales (*rut.*). Transverse line 8/5; three series of scales between the lateral line and the ventrals (*rut.*, *alb.*). Dorsal fin 12-rayed, with its origin a little behind the root of the ventrals, and terminating in advance of the first anal ray (*rut.*). Anal fin with 16 rays (*alb.*). Coloration silvery, but less intense than in the Bleak; back greenish; and no reddish tinge on any of the fins (*alb.*).

2. *On* Lichia vadigo, *Risso*. (Plate IV.)

Of the pelagic genus *Lichia* only three species are well known and sufficiently characterized, and all seem to be confined to the western parts of the Atlantic. *Lichia glauca*, the most common, has appeared in a few instances on the south coast of England, whilst the species to which I draw attention now is so scarce that Cuvier knew of two examples only, from the Mediterranean, and that the British Museum possesses only one specimen, 27 inches long, which was obtained by the late Rev. R. T. Lowe at Madeira.

On September 17th of last year Captain Macdonald secured another specimen, 20 inches long, of the present species. It was taken in a drift of herring-nets off Waternish Point, Isle of Skye, and



Peter Smit del. et lith.

LICHIA VADIGO

Mintern Bros. imp.

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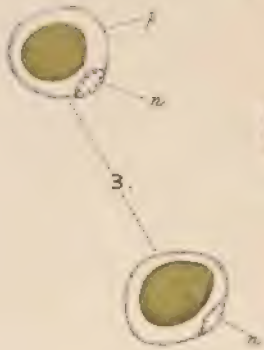

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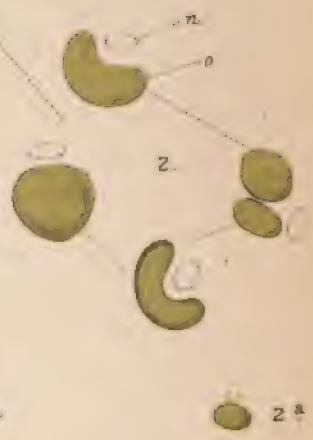

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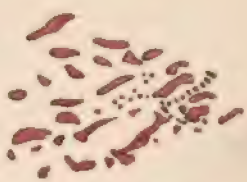

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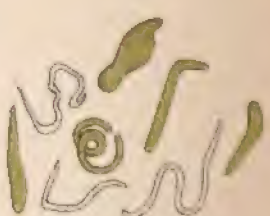
7.



6.

F.B. Beddard del.

F. Huth, Lith^r. Edin^r.

ÆOLOSOMA TENEBRARUM.

as it was unknown to the fishermen, Capt. Macdonald fortunately preserved it. Through the kindness of Lieut.-Colonel W. Gostwyck-Gard the well-preserved skin found its way to me for identification, and the following diagnosis of the species is taken from it :—

$$D.\ 7|\tfrac{1}{31}.\quad A.\ 2|\tfrac{1}{28}.$$

The shape of the fish is that of a Horse-Mackarel, but it is fuller, reminding one of a Pilot-fish, which it also resembles in the small size of its scales. The mouth is rather wide, the maxillary extending to the hind margin of the eye; both jaws are armed with a series of rather strong teeth, distantly placed. The dorsal spines are short and feeble, the anterior dorsal and anal rays forming a distinct lobe. Caudal deeply forked. Upper parts of a greenish-black hue, lower parts silvery, these two colours forming, where they meet, deep indentations by which they are dove-tailed into each other.

By this peculiar coloration the fish can be recognized at a glance. Like other species of *Lichia*, it feeds chiefly on fishes of the Herring family, and the specimen here described was no doubt in pursuit of its prey at the time of its capture.

6. Note upon the Green Cells in the Integument of *Æolosoma tenebrarum*. By Frank E. Beddard, M.A., F.Z.S.

[Received February 5, 1889.]

(Plate V.)

This Worm has been described by Vejdovsky ('Thierische Organismen der Brunnenwässer von Prag' (Prag, 1882), p. 61, and also 'System und Morphologie der Oligochaeten' (Prag, 1884), p. 21)[1] as new, but it may possibly be identical with *Nais aurigena* of Eichwald ("Erster Nachtrag zur Infusorienkunde Russlands," Bull. Soc. Imp. Nat. Moscou, t. xx. 1847, p. 359). It has appeared lately in great numbers in a tank at the Society's Gardens, near to that which produced a new species, *Æolosoma headleyi* (see my paper "Observations upon an Annelid of the Genus *Æolosoma*," Proc. Zool.

[1] An American naturalist, Mr. F. W. Cragin, has recently described two species of *Æolosoma* ("First Contribution to a Knowledge of the Lower Invertebrates of Kansas," Bull. Washbourn College Lab. 1887, no. 8, p. 31), and as the periodical is perhaps not generally accessible, I take this opportunity of calling the attention of systematists to the paper. The first species is named *Æ. stokesi*, but I cannot discover any characters by which it can be differentiated from *Æ. quaternarium* or *Æ. ehrenbergii*. The chief points in the description are as follows: —"Body cylindrical . . . . with eight articulations ornamented with bright salmon-red nuclei . . . . most numerous near extremities; setal fascicles in four rows . . . . each fascicle . . . . with four or five unequal simple bundles."

The second species, *Æ. leidyi*, appears to be new and to be a near ally of *Æ. tenebrarum*. It has "pale olive-green nuclei," and possesses "sigmoid spine-like setæ" in *all* the seta-bundles; in the posterior segments the fascicles are composed entirely of these setæ. In *Æ. tenebrarum*, as stated above, these setæ are *only* found in the posterior bundles.

Soc. 1888, p. 213). I am also able to take this opportunity of announcing the occurrence in Ireland of Vejdovsky's species *Æolosoma variegatum* ("*Æolosoma variegatum*, Prispevek ku poznani nejnizsich Annulatuv," SB. böhm. Ges. Wiss. 1885), of which some examples were kindly forwarded to me by Prof. Howes, who had himself received them from Prof. Hartog, of Cork. A comparison of *Æ. tenebrarum* with *Æ. variegatum* has convinced me that, as I stated in my paper, the affinities of *Æ. headleyi* are with the latter species. In both these forms the epidermic coloured cells are bright green, while in *Æ. tenebrarum* they range from greenish yellow to brownish olive. *Æ. tenebrarum*, furthermore, differs from all other species of the genus in possessing $\int$-shaped setæ in the posterior segments of the body, in addition to the hair setæ present in those segments and elsewhere: the setæ are stated by Vejdovsky (*loc. cit.*) to be bifid at the free extremity, but I have not been able to see this in my specimens; in Vejdovsky's specimens the epidermic coloured cells are of a pale yellow, contrasting therefore with the specimens studied by myself, which I am unwilling, however, to refer to a new species since they agree in all other particulars with *Æ. tenebrarum*.

This species of *Æolosoma* is extremely hardy if supplied with sufficient food. I have a large number of specimens which go on multiplying rapidly in a small bottle containing duckweed and a thin layer of vegetable débris at the bottom; the worms have remained in this small vessel for several months, although there is a tolerably thick scum of *Leptothrix* and *Bacilli* upon the surface.

On the other hand, if deprived of food they soon die; three specimens placed in a watch-glass containing water from the vessel in which they lived, but no appreciable quantity of vegetable débris, died in an hour and a half. The watch-glass was placed on a window-sill of north aspect. In these particulars *Æ. tenebrarum* contrasts with *Æ. variegatum*. I placed the specimens of the latter species in a bottle with abundant food; the water and the duckweed were obtained from a locality where there were no specimens of *Æ. tenebrarum*; one or two examples of the latter were, however, introduced by means of a pipette; these multiplied to a great extent, and I have not been able since to discover a single specimen of *Æ. variegatum*.

The green-coloured spots of *Æ. tenebrarum* are large cells with a thin peripheral layer of protoplasm containing a nucleus; in the centre is a large globule of oily appearance impregnated with the colouring-matter. Vejdovsky has remarked (*loc. cit.* p. 65) that the globule is stained black with osmic acid, thus proving it to be of an oily nature. I have found that osmic acid produces a dark brown stain.

The green colouring-matter naturally suggests chlorophyll; and Zacharias ("Studien über die Fauna des grossen und kleinen Teiches im Riesengebirge," Zeitschr. wiss. Zool. Bd. xli. pp. 499–500) states that in an *Æolosoma* (probably *Æ. variegatum*) he observed the green bodies dividing, and therefore considers that they may be parasitic algæ. With a view to discovering whether the bodies

in question were really coloured by chlorophyll, I kept a number of individuals in the dark for a considerable period (14 days), but without any change being apparent in the green bodies. This is not, however, a conclusive argument, since von Graff ("Zur Kenntniss der physiologischen Function des Chlorophylls im Thierreich," Zool. Anzeiger, 1884, p. 520) found that in *Hydra* kept in complete darkness for one hundred and nine days "there was no alteration either in the form or in the colour" of the chlorophyll-corpuscles.

Being unable to extract a sufficient quantity of the green pigment for spectroscopic investigation, I treated the living worm with solution of iodine (both alcoholic and in iodide of potassium) and obtained a very remarkable reaction.

The cells containing the green oil-drops are stained of a deep blue-black colour by iodine; the colour can be seen to gradually spread over the cell and to be limited to the peripheral protoplasm; almost as soon as the colour is developed it rapidly disappears, leaving the protoplasm stained yellow. I found it impossible to retain the stain for more than a few moments. If the worm was first killed by acids, &c., this iodine reaction did not take place; it is therefore evidently produced by the living protoplasm only. Although there is a certain resemblance here to the starch-reaction, the fact that the blue-black staining could not be produced after the death of the cells is against such an interpretation. I am inclined to think that the appearances described are produced by the deposition of elemental iodine, which is rapidly redissolved after the influence which caused its precipitation is withdrawn by the death of the cell [1].

I should be extremely glad if it could be found that the iodine reaction was characteristic of starch (or some carbo-hydrate), as I could then announce the formation of this body in cells coloured green by a substance that is *not* chlorophyll (I shall show this presently); this would be a very strong argument in favour of Pringsheim's "screen theory."

When the living worm was treated with various acids, the colouring-matter was dissolved out, often expelled with violence from the body; in the latter case the oily vehicle of the colouring-matter took the form of a fine coiled thread, thicker at one end; there were all gradations in form between this and an oval; the same effects were produced by crushing the worm. When the colouring-

[1] When a living example of *Æolosoma tenebrarum* was treated with Stokes's fluid, it was killed almost immediately, but no universal change of colour could be detected in the green bodies; when the worm was subsequently treated with iodine, the black reaction was produced, which lasted a very much longer time than when the living worm was submitted to the action of the same fluid. On treatment with alcohol, the black staining *immediately* vanished and the worm was decolorized. This seems to suggest that although the worm is killed by the treatment with Stokes's fluid, the green cells are not at once killed by that reagent—not so rapidly as they are by solution of iodine; and also it seems to prove that the precipitation of the iodine (if I am right in supposing that this is the nature of the black stain) is a function of the living cell.

matter, after being liberated from the cells containing it, was treated with an alkali (ammonia and potash were used), it altered its colour into a fine reddish purple; this could be changed back again into a yellowish green by treatment with mineral acids. When the coloured cells were treated by an alkali *in situ*, their colour changed gradually to a dirty brown; they never exhibited the fine purple hue shown when the pigment was expelled from the cell. The pigment was dissolved by turpentine forming a gamboge-yellow solution, which soon faded; this could be converted into violet by alkali. These reactions appear to show that the green pigment in *Æolosoma tenebrarum* is *not* chlorophyll.

It resembles, in fact, in the changes of colour produced by alkalis and acids, certain pigments described by Moseley ("On the Colouring-matters of various Animals, and especially of Deep-sea forms dredged by H.M.S. Challenger," Quart. Journ. Micr. Sci. vol. xvii. 1877, p. 1) and other observers, and is possibly a member of that numerous class of pigments which serve a respiratory purpose. It is curious that the colour of the pigment, dirty green when acid, and purple when alkali, appears to be more like that of the perivisceral corpuscles of *Spatangus purpureus*, as described by Geddes ("Observations sur le fluide périviscéral des Oursins,"[1] Arch. de Zool. Exp. t. viii. (1879), p. 483), than any other pigment of which I can find a description. In neither *Bonellein* nor *Chlorocruorin* does there appear to be, judging from the papers of Sorby ("On the Colouring-matter of *Bonellia viridis*," Quart. Journ. Micr. Sci. vol. xv. 1875, p. 169), Lankester (Journal of Anat. & Phys. vol. ii. and vol. iv. 1870), and MacMunn ("On the Chromatology of the Blood of some Invertebrata," Quart. Journ. Micr. Sci. vol. xxv. 1885, p. 469), a change of colour exactly like that of the green pigment of *Æolosoma*; and these are precisely the pigments which one would be, *à priori*, disposed to compare with that of *Æolosoma*, since they are Annelid pigments. However, in the absence of spectroscopic data, it is impossible to make any comparisons of great value.

Bonellein, which is a green pigment, is converted into violet by the action of *acids*; it evidently therefore differs materially from the pigment of *Æolosoma*. According to MacMunn (*loc. cit.* p. 478), chlorocruorin, when treated with an alkali after rectified spirit, became yellowish. I could not obtain this reaction, as the alcohol decolorized *Æolosoma tenebrarum*[2].

The pigmented cells of *Æolosoma* are by no means unlike those of *Thysanozoon*[3] (see Lang, "Die Polycladen," Naples Monographs,

[1] This pigment appears to be Echinochrom (see MacMunn, "On the Chromatology of the Blood of some Invertebrates," Quart. Journ. Micr. Sci. vol. xxv. (1885) p. 483.

[2] There are other green pigments of course, about which, however, nothing appears to be known, except that in some cases (*e.g.* those of *Trochæta*, *Phyllodoce*) they yield no absorption-bands.

[3] While working at the Plymouth Biological Station in August 1888 I observed a Planarian with large green spots exactly like those of *Æolosoma* (so

pl. 9. fig. 9), in many of which the pigment is collected into a globule lying in the middle of the cell; this globule is, according to Moseley ("On *Stylochus pelagicus*, &c.," Quart. Journ. Micr. Sci. vol. xvii. 1877, p. 30), of a fatty nature, which is a further point of similarity to *Æolosoma*.

A resemblance—perhaps of greater importance—is shown to *Ctenodrilus*; this genus consists of three species, in all of which the integument is dotted over with coloured spots. In *Ctenodrilus monostylos* (v. Zeppelin, "Ueber den Bau und die Theilungsvorgänge des *Ctenodrilus monostylos*," Zeitschr. wiss. Zool. Bd. xxxix. p. 617) and in *Ct. pardalis* (v. Kennel, "Ueber *Ctenodrilus pardalis*," Arbeit. Zool. Inst. Würzburg, Bd. v. 1882, p. 375) these spots are dark green. In the third species, *Ct. parvulus*, Dr. Scharff ("On *Ctenodrilus parvulus*," Quart. Journ. Micr. Sci. vol. xxvii. 1887, p. 592) states that the spots are dark green or violet, and that the colouring-matter is carried by an oily substance. I am not quite clear from Dr. Scharff's paper whether he means to say that the colour of these spots in *Ctenodrilus parvulus* is violet, or whether green and violet spots both occur. In any case, the alternation of green and violet is most suggestive in the light of what has been already said regarding the change of the green pigment of *Æolosoma tenebrarum* into violet by an alkali: moreover, Prof. Hartog informs me that he observed "claret-coloured" spots as well as green in one individual of *Æ. variegatum*; this fact is evidently of importance. Moseley's observations upon the blue and red colouring-substances of two land-planarians found at Sydney, N.S.W. ("On the Colouring-matters," &c., *loc. cit.* p. 11), suggest, however, the need for caution in drawing such an inference; he found that the *blue* pigment of one of the worms was converted into red by the action of acids, and surmised therefore that the *red* pigment of the other species would prove to be identical with this pigment; but this surmise proved to be incorrect.

I have already suggested that the green pigment of *Æolosoma tenebrarum* may be a respiratory pigment, capable of oxygenation and deoxygenation; the peculiar reaction with iodine which has been referred to may possibly fit in with this hypothesis. I may also mention that the change in colour of the cells from a bright yellow-green to a dull olive-brown is very suggestive of a corresponding taking up and giving off of oxygen, but I have no positive facts to offer, and the proof is indeed extremely difficult.

The blood of *Æolosoma tenebrarum* is quite colourless at all times. The plasma of the blood of *Æolosoma quaternarium* and *Æ. ehrenbergi* is stated by Vejdovsky (*loc. cit.* p. 18) to be colourless; but he describes cells with branched processes attached to the walls of the dorsal vessel in these species and in *Æ. tenebrarum*, which contain a yellow pigment. This *may* be hæmoglobin, but there are no obser-

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far as I can remember). I made a few notes upon the worm, which I have unfortunately lost; I hope, however, to have an opportunity of finding the Planarian again. It was not *Vortex* nor *Mesostomum* nor *Convoluta*.

Mr. Sclater exhibited some heads and skins of Antelopes shot by Mr. H. C. V. Hunter, F.Z.S., on the north side of the river Tana, N.E. Africa, and pointed out that they appeared to belong to a new species of the genus *Damalis*, which he proposed to call *Damalis*

Head of *Damalis hunteri*.
(From a photograph forwarded by Mr. Hunter.)

hunteri after its discoverer. It was said to be allied to ***Damalis senegalensis***, but at once distingnishable by the long upstanding tips of the horns, and the white band across the forehead. Mr. Hunter

had stated in a letter addressed to Mr. Sclater that this Antelope, of which he had sent home specimens of the male, female, and young male, is only found on the north side of the river Tana. The Somalis informed Mr. Hunter that it extended along the coast up to Kismayu. The Galla name for this Antelope was said to be "Haranta." Mr. Sclater hoped to be able to give a full description of this animal at a subsequent meeting.

Sir E. G. Loder, Bart., F.Z.S., exhibited a mounted skeleton of a Rocky-Mountain Goat (*Haplocerus montanus*), and made the following remarks :—

The Goat, a male, was shot by me September 1887 in the Rocky Mountains, Montana, U.S., long. W. 113° 10′, lat. N. 47° 30′, about 40 miles S.E. of Flat-head Lake.

Although the animal has been known to science for a long time, I do not know whether there is a complete mounted skeleton in any museum in the world.

The bones of the skeleton of the Rocky-Mountain Goat are accurately and minutely described by Sir John Richardson in the 'Zoology of the Voyage of the Herald,' published in 1854. A bad figure of the animal had previously been published by Richardson in 'Fauna Boreali-Americana' in 1829.

I think it possible that the present skeleton of the Rocky-Mountain Goat is the first that has ever been mounted. Mr. Henry A. Ward of Rochester, U.S., tells me that he has never had one.

This one will be preserved in my own collection, but I have two others (both females), one of which I shall present to the Natural History Museum, Cromwell Road, and the other to the Royal College of Surgeons, Lincoln's Inn Fields.

The chief peculiarity in the skeleton of the Rocky-Mountain Goat is in the shortness of the metacarpal bone, which is only about 4 inches long.

Dr. A. Günther, F.R.S., exhibited a mounted specimen of his *Gazella thomsoni* (Ann. N. H. ser. 5, xiv. p. 427), obtained by Mr. H. C. V. Hunter, F.Z.S., in Masailand, and pointed out its differences from *Gazella granti*.

The following papers were read :—

1. On a Skull of the Chelonian Genus *Lytoloma*.

By R. LYDEKKER, B.A., F.Z.S., F.G.S., &c.

[Received January 28, 1889.]

(Plates VI. & VII.)

In the year 1849 Sir Richard Owen, in his 'Monograph of the Fossil Reptilia of the London Clay,' Part I. Chelonia, published by the Palæontographical Society, described and figured (p. 27, pl. xi.) the imperfect skull of a large Marine Turtle from the Lower Eocene London Clay of Harwich, then in the possession of the late Prof. Thomas Bell, under the name of *Chelone crassicostata*. That species, it may be observed, was founded on the evidence of the shell, and it will be unnecessary on this occasion to enter on the question as to whether the specific association of the skull and shell is or is not correct.

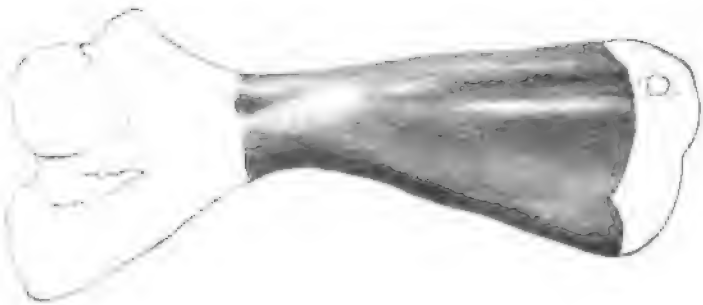
In that plate the specimen is figured of two thirds the natural size; one view showing the frontal aspect of the cranium, a second the right side, and the third the inferior aspect of the mandible, which is retained in its natural position. When the specimen was figured only the frontal aspect of the skull and the inferior and part of the lateral surfaces of the mandible were exposed, the whole of the base and occipital region of the cranium being concealed by the hard rock of the septarian nodule in which the specimen had been embedded. Moreover, on the frontal aspect of the cranium nearly all the outer shell of bone is wanting, the contour being mainly indicated by a cast of the inner surface of the cranial bones.

In the year 1863 this specimen was purchased, together with the remainder of Prof. Bell's collection from the London Clay, by the British Museum. There it has remained in its original condition until the beginning of the present year, when, with the permission of Dr. Woodward, the Keeper of the Geological Department, I put it into the skilled hands of Mr. R. Hall, assistant mason in that Department, by whom the skull of *Miolania* recently described by Sir Richard Owen in the 'Philosophical Transactions' was so skilfully developed. An equally successful result has rewarded his patience and skill in the present instance, and by carefully chiselling away the extremely hard matrix from the base of the specimen, the whole of the palatal and occipital aspects of the cranium, with the exception of that portion concealed by the mandible, is revealed in as perfect a condition as in any recent skull. Indeed, I am unacquainted with any other specimen of reptilian remains from the London Clay in which the bones are so perfectly preserved, and have such a sharp and fresh appearance.

Since this skull indicates a genus of Turtles totally distinct from all existing types, the only cranial evidence of which is presented to us, so far as English examples are concerned, by the present specimen, and another skull preserved in the Woodwardian Museum at Cam-

Lytoloma crassicostatum

West, Newman & Co. imp.



bridge, and figured by Sir Richard Owen in plate ix. of the memoir cited, under the name of *Chelone planimentum*, the description of the newly revealed palatal surface appears worthy of a place in the Society's 'Proceedings.' It is not, indeed, that the chief features of this surface have been hitherto unknown, for they have been described by M. Louis Dollo, of the Royal Museum of Natural History of Brussels, upon the evidence of specimens obtained from the Lower Eocene of Belgium, which are probably specifically identical either with the present form or with the one described as *Chelone planimentum*. Hitherto, however, M. Dollo has given no figure of the cranium, and I doubt whether any of the Belgian examples can be as beautifully preserved as the present one.

It has long been seen that the Chelonians from the London Clay described by Sir Richard Owen under the general term *Chelone* included many forms which could only be retained in that genus by employing that term in a much wider sense than that in which it is understood by students of recent herpetology. And from the year 1867 onwards a number of generic terms have been proposed for these and allied Chelonians from other deposits, which has resulted in an unusually complex synonymy. The chief features of this synonymy it is necessary to notice in some detail before proceeding to the consideration of the specimen before us.

In the year 1870, Prof. E. D. Cope, of Philadelphia, published his well-known "Synopsis of the Extinct Batrachia, Reptilia, and Aves of North America"[1], containing descriptions of the remains of Eocene Chelonians allied to the present form, which were arranged under several generic names, of which some had been first published at earlier dates. The names which it will be necessary to mention are—*Osteopygis*, dating from 1868[2], which was based on the evidence of the shell; *Euclastes*, dating from the preceding year[3], and founded on the cranium; *Lytoloma* (1870), based on the evidence of the mandible; and *Puppigerus* (1870), which was applied to several of the Chelonians from the London Clay described by Sir Richard Owen, *Chelone planimentum* not, however, being among the number. In the following year Prof. H. G. Seeley[4] proposed to distinguish the last-named species under the generic name of *Glossochelys*. Thus matters stood till the year 1886, when M. Dollo[5] described some Chelonian remains from the Lower Eocene of Belgium, which he regarded as closely allied to *Chelone crassicostata* and *C. planimentum*, and proposed to refer, together with these and some other species, to a new genus under the name of *Pachyrhynchus*. That name, however, as was pointed out in a joint paper by Mr. G. A. Boulenger and the present writer[6], was preoccupied; and in the following year its author[7] proposed to

[1] Trans. Amer. Phil. Soc. vol. xiv. pt. i. (1870).
[2] Proc. Ac. Nat. Sci. Philad. 1868, p. 147.
[3] *Ibid.* 1867, p. 39.
[4] Ann. Mag. Nat. Hist. ser. 5, vol. viii. p. 227 (1871).
[5] Bull. Mus. R. Hist. Nat. Belg. vol. iv. p. 130 (1886).
[6] Geological Magazine, dec. 3, vol. iv. p. 270 (1887).
[7] *Ibid.* vol. iv. p. 393 (1887).

family distinction. The present writer, in the communication laid before the Geological Society to which allusion has been made above, has, however, pointed out that there is such a complete transition from *Lytoloma* to *Thalassochelys*, that it appears impossible to justify the family separation of the extinct types.

Turning to the palatal aspect of the specimen, which is figured two thirds of the natural size in Plate VI., and comparing it with the skull of *Thalassochelys*, one of the first points which strikes the observer is its extreme shortness, the width at the widest part of the temporal arch being exactly equal to the length from the occipital condyle to muzzle; whereas in the Loggerhead the former diameter is considerably less than the latter, whilst in *Chelone* the difference between the two diameters is still greater. Still more noticeable is the backward position of the posterior nares, which are situated at a point one third the distance from the condyle to the muzzle, as indeed is mentioned in M. Dollo's description of the Belgian specimens. In that description it is, however, stated that the boundary of the posterior nares is formed by the development of palatal plates from the pterygoids. So far, however, as can be seen from the present specimen, it would appear that this border is really constituted by the palatines, since on either side there seems to be a distinct suture separating the bones forming the border of the posterior nares from the undoubted pterygoids. Looking at the arrangement of the palatines in the Loggerhead, it would seem much more natural that these should be prolonged backwards, rather than that the pterygoids should assume the condition assigned to them by M. Dollo. In either case the vomer is excluded from the posterior nares, but its position anteriorly is not shown in this specimen. The pterygoids themselves are comparatively short, and much more deeply emarginate laterally than in the Loggerhead, in which respect they agree with those of the genus *Argillochelys*, which I have recently proposed [1] for the reception of *Chelone cuneiceps*, Owen, of the London Clay. The palatal apertures of the temporal fossa are relatively large, and were probably nearly or quite as wide as long, in which respect they would also agree with *Argillochelys*, while they are not very widely different from *Thalassochelys*. The V formed by the inferior border of the presphenoid is wider and lower than in the Loggerhead, and more nearly resembles the same part in *Argillochelys*.

Turning to the occipital aspect of the skull, as shown in Plate VII., it will be seen that the general contour and arrangement of the individual bones is so essentially the same as in the Loggerhead, as in the writer's opinion to be absolutely conclusive that the two forms should be placed in the same family. The similarity between the two is especially marked in respect of the quadrate and the bones surrounding the foramen magnum, and also in the contour of the channel for the stapes (columella). In *Chelone* the channel for the stapes is very deeply seated and short, but it becomes shallower and longer in *Thalassochelys*; and in the present form it is still less deep,

[1] Quart. Journ. Geol. Soc. vol. xlv. pt. 2 (1889).

and appears merely to form the base of the valley formed by the sloping surfaces of the upper and lower halves of the quadrate. There is, however, a marked difference between the present form and *Thalassochelys* in the contour of the aperture leading into the labyrinth of the ear. Thus in the latter genus this aperture forms a long slit between the upper and lower bars of the exoccipital and opisthotic; whereas in the present form there is only a very slight notch in the exoccipital, and scarcely any production of the portion below the notch, so that the contour of the aperture in question is heart-shaped. A similar condition obtains in *Argillochelys*. In the contour of the tympanic ring, as seen from the lateral aspect, the present form differs from the Loggerhead in the more downward direction of the quadratic bar of the quadratojugal and in the more sudden deepening of the anterior wall of the cavity. Here also the form under consideration agrees with the other extinct genus from the same deposits.

The flatness of the inferior surface of the mandibular symphysis is well shown in this specimen; while there is an equally clear display of the unusual depth of the masseteric fossa, as indicated by the great prominence of the ridge forming its inferior border. In his description of the mandible of the type species of *Lytoloma*, Prof. Cope lays great stress on this characteristic feature of the masseteric fossa, as indicative of great biting power.

In conclusion, it appears from the study of the skull that *Lytoloma* should be regarded as a specialized modification of a generalized type of Chelonian, of which the nearest exsisting representative is to be found in *Thalassochelys*. Its close relationship in the characters of the skull with *Argillochelys*, in which the posterior nares have the same approximate position as in *Thalassochelys*, binds all the three genera into a single group, and indicates that the peculiar position of the posterior nares in *Lytoloma* cannot be looked upon as indicating more than a generic difference.

Postscript.

Since this paper was read I have come across a specimen in the British Museum (no. R. 918), from the London Clay of Harwich, which shows the associated cranium and carapace of this form, and which is therefore of extreme importance, since it enables us to confirm the reference of the cranium forming the subject of this communication to the so-called *Chelone crassicostata*, which, as I have already mentioned, was founded upon the evidence of the carapace.

The specimen in question has been long in the Museum, where it was merely entered as a carapace. Upon close examination I detected, however, at the anterior extremity what appeared to be a portion of the skull, and by careful development Mr. Hall has succeeded in showing the greater portion of the frontal aspect of the entire skull.

Now this skull, although considerably smaller, agrees in all

respects with the one forming the subject of this memoir, and may be confidently referred to the same species. The associated carapace agrees with the type carapace of *Chelone crassicostata* in its thick ribs and the shortness of the anterior lateral facets of the neural bones; and therefore serves to prove that Sir R. Owen was correct in referring the skull above described to that species.

Further, by comparison of drawings and also of some of the actual specimens from the Eocene of Belgium, originally described by M. Dollo under the name of *Pachyrhynchus gosseleti*, and subsequently made the type of *Erquelinnesia*, and finally referred to *Euclastes*, I am convinced that the Belgian form is specifically identical with *Lytoloma crassicostatum*—a view in which I believe I am justified in saying M. Dollo himself concurs. The evidence for this identification is afforded by the similarity in the contour of the cranium and mandible, and by the form of the neural bones of the carapace, the carapace of *L. planimentum* (Owen) being readily distinguished by the equality in the length of the anterior and posterior lateral facets of the neurals.

Finally the skull of no. R. 918 has enabled me to identify with this species a still younger cranium in the British Museum (no. 38954). This specimen is important as showing that in the young the posterior nares were situated much more anteriorly than in the adult; and I find that in the existing *Thalassochelys* there is a tendency as age advances for the posterior nares to recede to a certain extent, and also towards a gradual increase in the length of the mandibular symphysis.

EXPLANATION OF THE PLATES.

Plate VI.

Palatal aspect of the skull of *Lytoloma crassicostatum*; from the Lower Eocene of Harwich. Two thirds nat. size.

B.O., basioccipital; *B.S.*, basisphenoid; *E.O.*, exoccipital; *Mn.*, mandibular symphysis; *Ops.*, opisthotic; *Pal.*, palatine; *Pt.*, pterygoid; *Q.J.*, quadratojugal; *Qu.*, quadrate; *Sup.*, supra-occipital; *T.F.*, palatal aperture of temporal fossa; *t.a.*, aperture of labyrinth; *m.s.*, musseteric ridge of mandible; *pt.n.*, posterior nares.

Plate VII.

Fig. 1. Occipital aspect of the skull figured in Plate VI. *gn.*, slit for insertion of genio-hyoid and genio-glossal muscles; *stp.*, canal for stapes; *f.m.*, foramen magnum. Other letters as in Plate VI.

2. Dorsal aspect of the associated humerus.

Both figures two thirds nat. size.

2. On an apparently new Species of *Hyracodontotherium*[1]. By R. Lydekker, B.A., F.Z.S., F.G.S., &c.

[Received January 26, 1889.]

In 1877 Dr. H. Filhol[2] described and figured the left half of the palate of a comparatively small Ungulate under the name of *Hyracodontotherium*[3] *primævum*, the specimen having been obtained from the Upper Eocene (Lower Oligocene) Phosphorites of Central France. This specimen showed the typical Eutherian dental formula, the last two incisors and the third and fourth premolars being, however, represented only by their alveoli. The chief features connected with the dentition are, firstly, that the incisors are placed nearly in the same antero-posterior line, after the fashion of those of a Pig, and that the first incisor is a comparatively large tooth, much curved, and with a convex anterior and a flattened posterior surface. This tooth presents, indeed, a decided resemblance to that of *Hyrax*. There is no diastema behind the third incisor, and the canine is a small trenchant tooth, not unlike the last incisor. The anterior premolars have elongated, subtrenchant crowns, while the alveolus of the fourth premolar indicates the crown of that tooth to have been triangular and of simpler structure than the true molars. The latter are of a lophodont type, recalling those of the Perissodactylate genus *Chalicotherium*.

In his description Dr. Filhol made no attempt to determine the serial position of this peculiar genus, merely remarking that it appeared to show certain resemblances to *Anoplotherium* and *Hyrax*. In 1886 Dr. M. Schlosser[4] stated that *Hyracodontotherium* was evidently closely allied to the N.-American Eocene genus *Meniscotherium*, and inclined to the opinion that both were allied to *Chalicotherium*, although the entepicondylar foramen in the humerus of the American genus indicated affinity with the typical Condylarthra of Prof. Cope. By the latter writer[5] *Meniscotherium* is indeed made the type of a family of Condylarthra characterized by its specialized lophodont dentition.

So far as I am aware the above constitutes the literature of *Hyracodontotherium*.

Hyracodontotherium filholi, n. sp.

During last year the Natural History Museum acquired by purchase the specimen represented in the accompanying figure (p. 68), which was obtained from the Phosphorites of Bach, near Lalbenque, Lot, and evidently belongs to *Hyracodontotherium*. The specimen comprises a considerable part of the left half of the palato-facial region

[1] The name was published as *Hyracodontherium*, which should clearly be amended as above.
[2] Ann. Sci. Géol. vol. viii. art. 1. p. 153, pl. xiii. figs. 283, 284.
[3] The plate is erroneously lettered *Hyracodon*.
[4] Morphol. Jahrb. vol. xii. p. 21.
[5] Rep. U.S. Geol. Surv. Terr. vol. iv. p. 493 (1884).

of the cranium, showing the boundary of the nares, the whole of the premaxilla (of which the upper extremity is fractured and bent), and the anterior portion of the maxilla. The true molars are unfortunately wanting, but, with the exception of the third incisor, all the other teeth are preserved, although the summits of the crowns of the two remaining incisors are broken off. The position of the third incisor is indicated by its alveolus, and the suture between the maxilla and premaxilla clearly shown, both in the lateral and palatal aspects.

Hyracodontotherium filholi; from the Phosphorites of Central France. Palatal and lateral aspects of the anterior portion of the cranium, nat. size.

pmx., premaxilla; *mx.*, maxilla.

On comparison with the figure of *H. primævum* very striking differences are exhibited by the present specimen, which indicates a larger animal. Thus, whereas the canine is nearly similar in the two specimens, the first incisor of the latter is very much larger, and the narial aperture is likewise of much greater extent; but whereas

in the former the space occupied by the four premolars exceeds that between the canine and the anterior border of the first incisor by the whole width of the latter, in the present specimen the first of these dimensions only slightly exceeds the second. Again, whereas in the type species the first premolar is not longer (antero-posteriorly) than the canine, and is much shorter than pm. 3, in the present specimen the length of pm. 2 is much greater than that of the canine, and its difference from that of pm. 3 less than in the type. Further, there is a larger interval between i. 2 and i. 3 in the specimen under consideration.

These differences are indicated by the following measurements :—

	H. primævum.	*H. filholi.*
Ant.-post. diam. of i. 1	0,006	0,011
Transverse „ „	0,006	0,010
Ant.-post. diam. of canine	0,007	0,008
„ „ pm. 1	0,007[1]	0,0095
„ „ pm. 2	0,009[1]	0,010
Length of space occupied by premolars ..	0,030	0,039
Interval between canine and anterior border of i. 1	0,022	0,035
Length of outer narial border	0,023	0,038
Interval between i. 2 and i. 3	0,003	0,007

There is of course the possibility of these differences being sexual rather than specific, in which case the present specimen would be the male, and the increase in the first incisor would be analogous to that of the canine in the male Pig. In the absence, however, of any known instance, except in the case of the Elephant, of such a difference in the incisors of the two sexes, I am disposed, at least provisionally, to regard the present specimen as indicating a second species of the genus, which may be known by the name of *H. filholi*.

The present specimen is important as showing that pm. 4 differs from that of *Meniscotherium* in having only a single outer lobe.

Whether the resemblance of the anterior portion of the skull of *Hyracodontotherium* to *Hyrax* indicates a genetic relationship between the two forms, the evidence at present available is insufficient to decide. It is, however, significant that both the Hyracoidea and the Condylarthra have such a similar type of carpus and tarsus that they are bracketed together by Prof. Cope in a single group. It may be added that the presence of an entepicondylar foramen in the humerus of *Meniscotherium* is in favour of Cope's reference of that genus to the Condylarthra rather than to the Perissodactyla.

Finally, I have to thank Dr. H. Woodward for permission to bring the specimen forming the subject of this communication under the notice of the Society.

[1] These dimensions are taken from Dr. Filhol's figure, and differ somewhat from those given in the text.

3. On some Fishes from the Kilima-njaro district.

By Dr. A. GÜNTHER, F.R.S., F.Z.S.

[Received February 1, 1889.]

(Plate VIII.)

The fishes of the systems of the great African rivers flowing north-, west-, or eastwards are sufficiently well known to allow us to make a safe inference as to the forms which inhabit the fresh waters of the centre of the continent. Although many new species or even new genera may be discovered, it can hardly be expected that they will add a new distinct feature to what we already know of the general character of the freshwater fauna of Tropical Africa.

The difficulties of preserving fishes and of transporting them to the coast will long continue to be serious obstacles to our detailed acquaintance with Central-African fishes; and therefore it is all the more the duty of the naturalist at home to pay due attention to the specimens, however few in number, which the traveller has been able to get through the perils of a long and tedious overland journey.

From the fresh waters of Kilima-njaro Dr. G. A. Fischer, who was sent by the Geographical Society of Hamburg into the Masai-country, was the first to bring some fishes to Europe. They were described by Dr. J. G. Fischer in the 'Jahrbuch der Hamburger wissenschaftlichen Anstalten,' vol. i. 1884, p. 27, *et seqq.* Dr. Fischer seems to have obtained them from the waters flowing westwards from the western slope of the mountain-range, whilst the two British travellers mentioned below have collected on the southern and south-eastern rivers. This may account, at least partly, for the differentiation of the species obtained by those travellers.

Dr. Fischer's specimens belonged to four species, viz., *Chromis mossambicus*, Gthr. (closely allied to the common and widely spread *Chromis niloticus*), a species of *Clarias* which Dr. J. G. Fischer considers to be the *Clarias mossambicus* of Peters, and two new species of Barbels, *Barbus pagenstecheri* and *Barbus neumayeri*.

To these four species I can now add four others.

1. The fish first to be described here was discovered by Mr. Henry C. V. Hunter, F.Z.S., in Lake Chala, the Crater Lake of Kilima-njaro. Mr. Hunter writes that no other fish was found by him in the lake, and that the fish does not exist in any of the other fresh waters round the mountain.

The specimen is a dried skin, 11½ inches long, and in a good state of preservation: it belongs to a form closely allied to *Chromis* and *Hemichromis*, but readily distinguishable from both those genera by the presence of four anal spines. This new genus may be called *Oreochromis*, and the species *Oreochromis hunteri*.

OREOCHROMIS HUNTERI, sp. nov.

B. 5. D. $\frac{17}{11}$. A. $\frac{4}{10}$. P. 15. L. lat. 35. L. transv. 5/15.

The height of the body is nearly equal to the length of the head,

R. Mintern del et lith.

A. SYNODONTIS PUNCTULATUS. B. TYLOGNATHUS MONTANUS.

Mintern Bros. imp.

and one third of the total length, without caudal. Snout much longer than the eye, the præorbital being longer than, and as high as, the orbit. The teeth in the upper jaw form a broad villiform band, those of the outer series being a little stronger then the others. These stronger teeth, which are thirty-eight in number on each side, have the crown slightly compressed, some showing a distinct notch and being brown at the tip. Interorbital space twice as broad as the orbit, convex. Scales on the cheek rather small, in three series; scales cycloid, of moderate size; the lateral line is interrupted below the end of the spinous dorsal.

Dorsal spines gradually increasing in length; the sixth ray is the longest, reaching backwards to the root of the caudal; pectoral and ventral fins long, extending to, or nearly to, the anal.

Coloration uniform dusky, but some of the scales on the back seem to have had a reddish-brown spot at the base.

2. The other species were obtained by F. J. Jackson, Esq., F.Z.S., in the river Ruva, in the Arusha country.

SYNODONTIS PUNCTULATUS, sp. nov. (Plate VIII. fig. A.)

D. 1/7. A. 11. P. 1/8. V. 8.

Allied to *Synodontis serratus* and *Synodontis guttatus*.

The gill-opening extends downwards to before the root of the pectoral fin. Mandibular teeth shorter than the eye, about 24 in number, no villiform teeth behind them. Maxillary barbels a little longer than the head, not fringed; mandibular barbels provided with filaments, the outer ones shorter than the head. The length of the head (from the snout to the gill-opening) is one fourth of the total length (without caudal). Nuchal carapace not much arched, longer than broad; its posterior processes do not extend behind the dorsal spine. Dorsal and pectoral spines subequal in length, and somewhat shorter than the head; both these spines are slightly serrated in front. Humeral process twice as long as high, pointed behind. The distance between the dorsal and adipose fins is more than the length of the former, but shorter than the head. Head, body, and adipose fin covered with very numerous and very small brown dots. The dots become somewhat larger above the anal fin, on the free portion of the tail, and on the caudal fin, but none exceed the pupil in size.

Two specimens, of which the larger measures 8 inches.

TYLOGNATHUS MONTANUS, sp. nov. (Plate VIII. fig. B.)

D. 12. A. 8. L. lat. 37. L. transv. 5/6.

Snout very obtuse, rounded, with small tubercles, and with fleshy continuous lips, covering an inner, sharp, horny, labial edge on the upper as well as lower jaw. The mouth is crescent-shaped and at the lower side of the snout. A slender barbel is hidden in a deep recess at the corner of the mouth, and the upper lip is overhung by

a broad fold pendent from the end of the snout. Eye of moderate size, somewhat behind the middle of the length of the head, two ninths of the length of the head, and nearly one half of the broad and flat interorbital space. There are three longitudinal series of scales between the lateral line and the root of the ventral fin. Body rather elongate, its depth being equal to the length of the head and two ninths of the total length, without caudal. The origin of the dorsal fin is considerably in advance of that of the ventral; in fact, the fin occupies the middle of the distance between the end of the snout and the root of the caudal. Pectorals inserted at the lower side of the body, horizontal, but not reaching the ventral; ventrals long, broad, nine-rayed, extending beyond the vent; caudal fin deeply forked. Coloration uniform; a small black spot on the shoulders behind the upper end of the gill-opening.

One specimen, 5 inches long.

Unless one or the other of the Abyssinian fishes described by Rüppell as *Barbus* belongs to *Tylognathus*, this would seem to be the first African species of this genus which hitherto has been known to be represented in India and Syria. However, it should be remembered that the separation of this genus from *Labeo* is artificial, and maintained for other reasons (see Catal. Fish. vii. p. 62). *Labeo* is well known to be a type common to both the African and Indian regions.

BARBUS JACKSONI, sp. nov.

D. 10. A. 8. L. lat. 37. L. transv. 6/5.

Two pairs of barbels, the posterior rather longer than the anterior and about as long as the eye. Eye large, longer than the snout and two sevenths of the length of the head. Interorbital space convex, much wider than the orbit. The osseous dorsal ray is very strong and smooth, longer than the head. There are three and a half series of scales between the lateral line and the root of the ventral fin. Body compressed, its height being two sevenths of the total length, without caudal; head small, two ninths of the same length. The small mouth is anterior, the upper jaw but slightly overlapping the lower, lips not thickened. The origin of the dorsal fin is opposite to the root of the ventral, and but little nearer to the end of the snout than to the root of the caudal; caudal fin forked. Three round black spots on the side of the body; the two anterior above, and the third on, the lateral line; the first opposite to the seventh, and the second opposite to the sixteenth scale of the lateral line.

One specimen, $3\frac{3}{4}$ inches long.

4. Description of a new Antelope from Southern Central Africa. By Dr. A. Günther, F.R.S., Keeper of the Zoological Department, British Museum.

[Received February 18, 1889.]

A short time ago Mr. Morton Green, a resident and J.P. in Natal, brought to the Museum, beside several other interesting horns of Antelopes, a very singular head of a type of Antelope which evidently has hitherto escaped observation. Mr. Green stated that he had never seen the like of it during the thirty years he resided on the frontiers of Natal, nor could he ascertain from any hunter that he had seen the Antelope alive. He obtained this specimen many years ago through a hunter who went trading for him into the Zambezi region. This man told him that he had bartered it from a native chief who told him that the animal was extremely scarce. Mr. Green not being able to obtain any further information in the colony, has brought it now to England, with the object of seeing it deposited in a public Museum, where the information as to the mode of its acquisition would be preserved.

The horns are evidently those of a very old animal; of the skull, unfortunately, only a portion of the frontal bones is preserved. The horns are gently curved backwards, showing the slightest indication of a twist near to the top; they measure thirty-one inches along the curve, and thirty in a straight line from the base to the tip. The distance of their ends is twenty-two inches. A transverse section taken three inches from their base would represent a triangle, the posterior side of which is slightly longer than the outer one; at this portion the horn is broader from side to side than from the front backwards. In about the middle of the length of the horn the transverse section becomes an isosceles triangle, passing into a circular shape in the last fourth of the length.

The trihedral shape of the basal half of the horn is produced by a prominent, but obtuse ridge in front of the horn; this ridge is in the median line at the base of the horn, runs then a little inside of the median line for a short distance, and is finally directed towards the outside of the horn, disappearing altogether in the distal conical portion. The posterior side of the horn is remarkably flat and broad.

The annulations are distinct only in the basal portion and very obscure further on, the distal half being smooth. The annuli are very low, separated from each other by shallow grooves, and provided with narrow concentric wrinkles on the posterior side of the horn.

The cranial base of the horns is broad and flat, without enlargement of the bone. The least distance between the bases of the horns is two and a half inches. The supraciliary foramina are situated opposite to the middle of each horn, distant from it about one inch. The distance between these foramina is three inches.

Of the known genera of Antelopes none approach this singular type more nearly than *Tragelaphus*. *Tragelaphus* has, likewise,

horns trihedral in shape at the base; and if we imagined the longitudinal axis of the horns of our specimen twisted outwards, a form

a. Horns of *Antilope triangularis*.
a. Front view. *b*. Side view. *c*. Transverse section of the horn, of the natural size, taken at the place marked ×.

of horn would be produced which could not be separated from *Tragelaphus*. And there is no doubt that the ancestral form of *Tragelaphus* must have resembled, or been identical with, our type.

But without being acquainted with the cranial, dental, or other characters, it would seem to me premature to offer an opinion as to its generic relations, or even to give to it a distinct generic term, much as the shape of the horns differs from that of all other known Antelopes. It therefore seems to me to be sufficient to distinguish it for the present as a species of *Antilope* in the Cuvierian sense, viz. as *Antilope triangularis*.

5. Note on a Bornean Porcupine, *Trichys lipura*.

By Dr. A. GÜNTHER, F.R.S., F.Z.S.

[Received February 18, 1889.]

In the 'Proceedings' of this Society for 1876, p. 739, I described a small species of Porcupine from the west coast of Borneo under the name of *Trichys lipura*.

The genus established for this Porcupine was characterized by the absence or rudimentary condition of a tail and by the form of its skull. The former character proves to be spurious, perhaps due to mutilation, and has to be abandoned; whilst the latter suffices by itself to generically separate this Porcupine from *Atherura*.

Since the publication of that paper the British Museum has received two other specimens: one, a female, obtained by Mr. C. Hose at Baram, Sarawak[1], again, does not show the trace of a tail; whilst the other, of which the skin as well as the skeleton are preserved, and which was found by Mr. A. Everett near the Batang Kubar River in Sarawak, possesses a long and slender tail.

Thus, of two specimens examined by Gervais (Voy. Bonite, Mamm. p. 60), and of three specimens which have come under my notice, three were tailless, and only two provided with this appendage. This fact, combined with Mr. Low's statement that the natives had assured him that this Porcupine was tailless, seems clearly to prove that the loss or absence of the tail is of very frequent occurrence; and to judge from the condition of the integuments, I am inclined to believe that the tail is lost shortly after birth, if, indeed, its absence is not congenital[2].

However, the discovery that *Trichys lipura* is normally provided with a tail has induced me to reexamine the literature in order to ascertain whether tailed specimens of this Porcupine had been noticed by previous authors. And there is no doubt that Waterhouse (see Nat. Hist. Mammal. vol. ii. p. 470) had examined four specimens of it, or, at least, of a closely allied species[3], in the Leyden Museum.

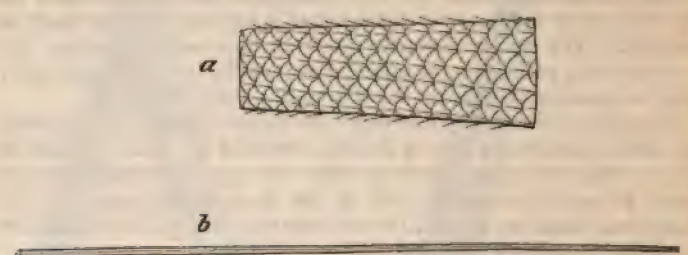
[1] Mr. Hose says that the native name is "*Ankis*."

[2] I, therefore, see no reason why the specific term "*lipura*" should not have the same claim to being retained as those of Paradisea *apoda*, Cypselus *apus*, &c.

[3] He says that the specimens in the Leyden Museum are *from Siam*.

He, however, referred them to *Atherura fasciculata* of Buffon and Shaw, which is a Porcupine with *long* spines of a different coloration and with a thick bundle of terminal quills at the end of the tail, and, probably, identical with *Atherura macrura*. Waterhouse describes distinctly the *short* spines of our Porcupine and the peculiar form of the terminal tail-quills; and when he mentions the rhombic scales of the tail as provided with a median "ridge," he clearly describes the *appearance* of the short hair which starts from the base of each scale and is closely adpressed to its median line.

To supplement my first account of *Trichys lipura*, I proceed now to describe the tail of a full-grown specimen, of which the skin measures about 15 inches without tail. The tail is long (8½ inches) and slender, longer than one half of the body and head, covered with spines for about one inch of its basal portion. Nearly in the whole of its length it is covered with rhombic scales of relatively large size (fig. *a*), and arranged regularly in oblique series or rings. A short fine hair, which is never spinous as in *Atherura macrura*,



a. Portion of the tail of *Trichys lipura*, showing the arrangement of the scutes and hairs. *b*. One of the terminal caudal bristles.

starts from the base of each scale and lies closely adpressed to its median line, giving to the scale the appearance of being keeled (like the scale of a snake) as mentioned already. Towards the end of the tail the hairs become longer, and the terminal quills (fig. *b*) are much elongate, 2–3 inches long, and compressed with a shallow groove, like blades of grass, only much narrower, and form a thin bundle. The majority are truncate at their extremity and hollow. These quills, therefore, differ much in shape from those of *Atherura*, and are, in fact, a less developed form of the caudal quills of other Porcupines. They are unfit for producing the rattling or quivering noise which the more highly specialized forms of Porcupine make under the influence of fear or anger[1].

[1] Morphologically as well as physiologically the terminal tuft of quills on the tail of Porcupines reminds us of the rattle of Rattlesnakes.

With the evidence now before us there is no longer [1] any reason to doubt that the skeleton described by Gervais really belongs to *Trichys*. He gives as the numbers of vertebræ:—D. 16, L. 5, S. 4, C. 21, whilst I find in our skeleton D. 16, L. 6, S. 3, C. 24. The caudal vertebral column bears four compressed, hatchet-shaped chevron-bones between the fourth and eight caudal vertebræ. The eighth vertebra marks the boundary between the proximal and distal portions of the caudal series, differing much in shape from the seventh as well as the ninth, and having the transverse process dilated into a broad lamina extending along the whole length of the centrum. The seven vertebræ preceding it are provided with strong and long lamelliform transverse processes, whilst the apophyses rapidly disappear from the ninth vertebra backwards.

P.S.—Through the kindness of Dr. Jentink I have been able to examine one of the specimens described by Waterhouse as *Atherura fasciculata*, and find that I was right in supposing that they are identical with *Trichys*. I have to add that Dr. Jentink adopts now Waterhouse's identification, an opinion which, for reasons stated, I do not share. Dr. Jentink also informs me that the specimens in the Leyden Museum come from Malacca, not from Siam.—*March 11th*.

6. On certain Points in the Anatomy of the Accipitres, with reference to the Affinities of *Polyboroides*. By Frank E. Beddard, M.A., Prosector to the Society.

[Received February 19, 1889.]

I have recently had the opportunity of dissecting a specimen of *Polyboroides* which died in the Society's Gardens; the specimen was deposited by Lord Lilford, who expressed a wish that the skin should go to the British Museum; after the bird was skinned it was still possible to examine into the arrangement of certain of the muscles and of other organs, which examination has, in my opinion, thrown some light upon the affinities of the bird. For this reason I think it worth while to publish the notes of my dissection, although this paper is necessarily very far from containing a complete account of the anatomy of *Polyboroides*.

I have not attempted to give any description of its osteology, which has been lately worked out in detail by Prof. Milne-Edwards[2], but in a different species, *P. radiatus*. This account shows that the supposed resemblances of *Polyboroides* to *Serpentarius* are purely superficial, and that in reality it comes nearest to the Buzzards. The position assigned to the genus by Sharpe[3] (in the subfamily Accipi-

[1] Proc. Zool. Soc. 1876, p. 712.

[2] Milne-Edwards and Grandidier, Hist. phys. nat. et polit. de Madagascar: Oiseaux, tom. i. p. 50.

[3] B. M. Catalogue of Birds, vol. i. p. 47.

trinæ of the family Falconidæ), and by G. R. Gray[1], is, as Milne-Edwards acknowledges, in the main justified by the osteological characters; Milne-Edwards, however, considers that its peculiarities necessitate the creation of a separate subfamily for its reception. This view is accepted by J. H. Gurney[2].

The Accipitres have been divided by Prof. Huxley[3] into three groups—(1) Cathartidæ, (2) Gypaetidæ, (3) Gypogeranidæ—on the characters of the skeleton. Prof. Garrod's investigations[4] emphasized the naturalness of this grouping; he showed that these three divisions could be defined by the presence or absence of certain muscles in the leg.

In the Cathartidæ the ambiens, semitendinosus and accessory semitendinosus, and femoro-caudal are present, the formula being on Garrod's system AXY+.

In the Gypaetidæ (termed Falconidæ) the muscles present can be indicated by the formula A+.

In the Gypogeranidæ (*Serpentarius*) the formula is BXY+.

These muscular divergences led Prof. Garrod to remove *Serpentarius* and the Cathartidæ from the Accipitres and to associate them with other birds. Without following Prof. Garrod in this latter alteration of existing arrangements, it must certainly be admitted that his results entirely justify the breaking up of the Accipitres into the three groups already indicated.

I do not, however, find myself able to agree with Prof. Garrod in believing that the absence of the semitendinosus muscle is absolutely distinctive of *all* the Gypaetidæ.

I have found this muscle in *Falco subbuteo*, where it was rather feeble and apparently fused at its origin with the semimembranosus, but it ended in a separate and perfectly distinct tendon and was present on both legs; in the Merlin (*Falco æsalon*), where it was a little better developed; and finally in *Circus maurus*.

Apart from these exceptions, which do not affect the classification of the group, the formula of Gypaetidæ is, as stated by Garrod, A +.

Polyboroides typicus possesses the ambiens and femoro-caudal alone of the leg-muscles, upon the variations of which Garrod's system was based; it therefore agrees with *Accipiter*, *Circus*, &c., and should be referred to the Gypaetidæ and *not* to the Gypogeranidæ.

In examining the muscles of the wing I have compared *Polyboroides* with *Serpentarius*, *Cathartes*, and with *Gypohierax* as a type of the Falconidæ.

The *tensor patagii brevis*[5] of each wing is a stoutish muscle which divides into two tendons, inserted as shown in fig. 1 (p. 79); each tendon is slight and thin and of equal diameter throughout.

[1] Hand-list, i. p. 38.

[2] 'A List of the Diurnal Birds of Prey,' &c. (London, Van Voorst), p. 18.

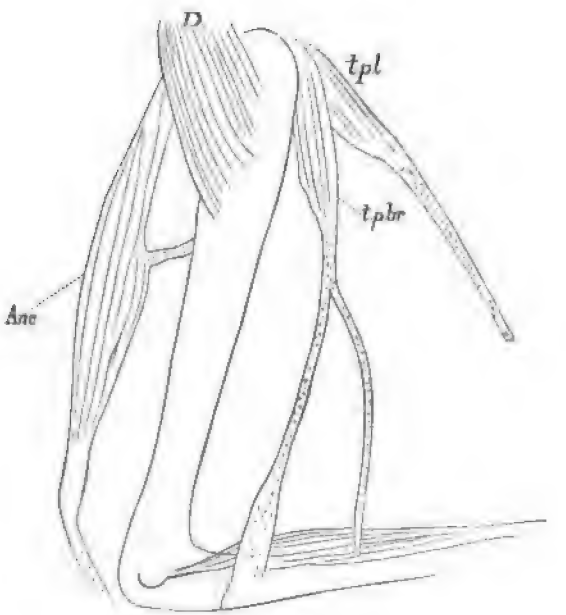
[3] "On the Classification of Birds," P. Z. S. 1867, p. 462.

[4] "On certain Muscles in the Thigh of Birds, and on their Value in Classification," P. Z. S. 1873, p. 634.

[5] These muscles were dissected in another specimen.

I find an identical arrangement of these tendons in *Circus maurus*, and they appear to be exactly the same (judging from a MS. sketch by Forbes) in *Spizaetus occipitalis* and *Aquila imperialis*. In *Milvago chimachima* and in *Haliaetus albicilla* and *Astur approximans* (Forbes, MS.) the tendon is single, but there is a trace of the second tendon in a short fibrous slip which, arising from near the

Fig. 1.



Tensores patagii and other muscles of *Polyboroides typicus*.

t.p.l, tensor patagii longus; *t.p.br*, tensor patagii brevis; *Anc*, anconeus; *D*, deltoid.

(The dotted parts represent tendons in this and the following figure.)

insertion on to the forearm of the *tensor patagii* tendon, ends upon the patagium. This tendinous band may, however, perhaps be considered as the equivalent of the tendon which in other Accipitres (v. *infrà*) unites the tendon of the *tensor patagii longus* with that of the *tensor patagii brevis* at the insertion of the latter on to the forearm.

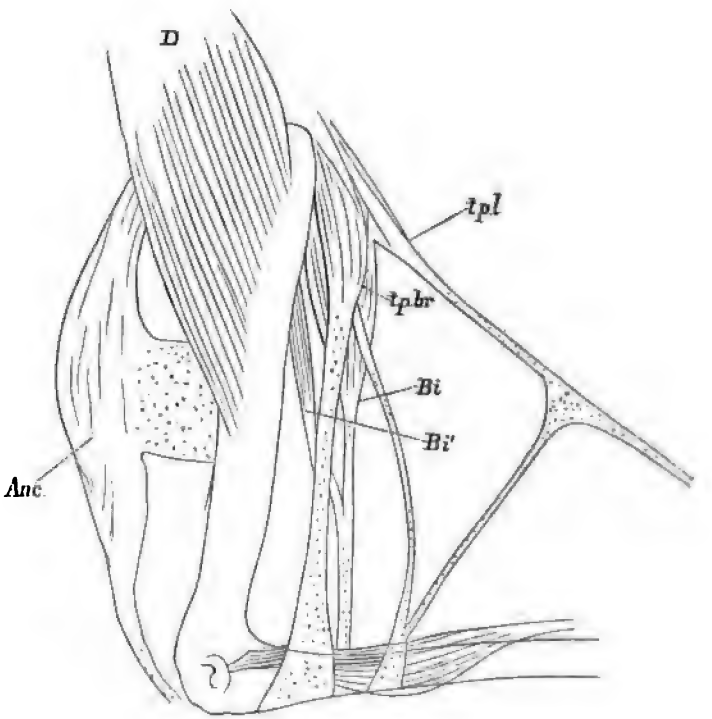
In *Gypohierax*[1] the *tensor patagii brevis* resembles that of *Polyboroides* except that the outermost of the two tendons near to the

[1] Fürbringer, Untersuchungen z. Morph. und Syst. d. Vögel, pl. xxii. fig. 9.

muscles is united by a fibrous band with the tendon of the *tensor patagii longus*; so also in *Gypaetus barbatus*[1], which in the attachment of the band resembles *Cathartes*.

In *Serpentarius*, in *Cathartes*[2], and in *Gypagus papa* (Garrod, MS.) the tendon of the *tensor patagii brevis* divides into two; the inner branch (see fig. 2) is very broad and diffuse, while the outer

Fig. 2.



Tensores patagii and other muscles of *Serpentarius*.
Bi, biceps; *Bi*[1], accessory biceps. Other lettering as in fig. 1.

is a thin even tendon; the latter at its point of insertion on to the forearm is connected by a tendinous band with the tendon of the *tensor patagii longus*. These three types present, therefore, a disposition of the patagial tendons which differs from that found in

[1] Figured by Fürbringer, *loc. cit.*
[2] Figured by Nitzsch and copied by Fürbringer, *loc. cit.* pl. xxii. fig. 8.

the Falconidæ. *Polyboroides* is in these particulars near to the Falconidæ. *Cathartes* is described and figured by Fürbringer[1]. *Serpentarius* is neither figured nor described in Fürbringer's work.

The line of attachment of the *deltoid* to the humerus and, in consequence, the size of that muscle vary in the three types of Accipitres. It is largest in *Serpentarius* and smallest in *Cathartes*; in the former bird the length of the attachment of the muscle to the humerus is about half the entire length of the bone. In *Cathartes* the proportion is (roughly) as 1 : 4. *Gypohierax* is intermediate but nearer to *Serpentarius*. *Polyboroides* agrees with *Gypohierax*.

In all Accipitres diurnæ the *anconeus* has an accessory head arising from the humerus close to the insertion of the *latissimus dorsi*. But there are some differences of detail.

In *Serpentarius* (fig. 2) the accessory head of the *anconeus* forms a particularly broad flat tendon. The anterior of the two *latissimi dorsi* end, as in most birds, in a narrow tendon; this gives off a branch to the integument just before its insertion.

In *Gypohierax* the accessory head of the *anconeus* is very narrow, but the relations of the *latissimus dorsi* to it and to the integument are precisely as in *Serpentarius*.

Cathartes is rather different from both these types; the accessory head of *anconeus* is almost completely split into two, the thickness of the tendon being very unequal in different parts. The *latissimus dorsi* tendon splits into two as in *Serpentarius* and *Gypohierax*; one tendon passes above and the other below the posterior *latissimus dorsi* close to its insertion; the uppermost of these is attached to the belly of the *anconeus*.

Polyboroides, as in other myological relations, comes nearest to *Gypohierax*, but I am unable to state whether the branch of the *latissimus dorsi* tendon to the integument is present.

It is also worth remarking that while the scapular head of the *anconeus* in *Cathartes* is distinctly double and entirely tendinous—one tendon arising from the scapula itself, the other from the *supinator* muscle—this muscle originates in all the remaining types (including *Polyboroides*) from the scapula alone and by a single head, which is chiefly fleshy though partly tendinous.

The size of the second pectoral muscle offers characters by which the affinities of *Polyboroides* can be to some extent determined. In *Cathartes aura* the attachment of that muscle reaches nearly to the end of the carina sterni. In *Gypohierax angolensis* the muscle reaches only for a very short distance along the carina sterni; this is also the case with *Serpentarius* and *Polyboroides*.

The proportions between the total length of the carina sterni and the breadth of the second pectoral muscle where it is attached close to the base of the carina sterni are indicated in the following table:—

[1] *Loc. cit.* pl. xxii. fig. 7.

	Length of carina sterni.	Length of attachment of 2nd pectoral along the carina.
Cathartes aura.....	82	72
Serpentarius reptilivorus	115	40
Gypohierax angolensis	84	34
Polyboroides typicus.....	56	24

The structure of the syrinx is not clearly indicative of the affinities of *Polyboroides*, but I propose to defer for the present the description of this organ in the Accipitres.

The conclusion to which these facts lead is that *Polyboroides* is not even an aberrant type of the Falconidæ; its muscular anatomy lends no support to the view that it should be regarded as the representative of a special subfamily.

7. On a Species of Crested Penguin (*Eudyptes sclateri*) from the Auckland Islands. By Sir Walter Buller, K.C.M.G., F.R.S., C.M.Z.S.

[Received February 19, 1889.]

(Plate IX.)

A recent study of the various species of *Eudyptes* inhabiting New Zealand and the neighbouring islands has satisfied me that three very distinct species of Crested Penguin have been hitherto confounded by ornithologists under the name of *Eudyptes chrysocome*. I have endeavoured to make this clear in the concluding part of my 'Birds of New Zealand' (2nd ed. pp. 287–293); but I gladly avail myself of the Secretary's invitation to exhibit specimens this evening and to offer a few observations on the subject.

The common New-Zealand bird, hitherto treated by most authors as being identical with *Eudyptes chrysocome* of the Falkland Islands, is undoubtedly a different species, and I have accordingly restored to it Mr. Gray's name of *pachyrhynchus*. It is distinguishable from the latter by its thicker bill and by the character of its lateral crests, which are merely an extension of the golden superciliary streak, seldom reaching more than an inch beyond the crown, and never more than two inches. *Eudyptes chrysocome*, on the other hand, exhibits on each side of the head an abundant crest of drooping plumes, from three to five inches in length, besides presenting other minor differences.

Eudyptes filholi, Hutton, from Campbell Island, does not appear to be separable from *E. saltator*, Stephens, and this again (as already pointed out by Messrs. Sclater and Salvin) is certainly referable to the true *Eudyptes chrysocome*, Forster, although Mr. Sharpe, in his Zoology of Kerguelen Island (Phil. Trans. R. S. vol. 168. p. 158), has kept the two latter forms distinct.

1

2

J. Smit del. et lith. Mintern Bros. imp.

FIG. 1. HEAD OF EUDYPTES SCLATERI
" 2. " " " PACHYRHYNCHUS.

But the bird to which I desire to call particular attention this evening is the Crested Penguin of the Auckland Islands, a species hitherto supposed to be the same as that inhabiting New Zealand, an example of which was lately living in the Society's Gardens at Regent's Park.

In April last my attention was directed to this bird by Dr. Sclater, who sent me a note saying:—"The bird just received from the Auckland Islands seems quite distinct from the New Zealand species."

I at once repaired to the Gardens and made as close a survey as I could of this Penguin as it waddled about within its glass enclosure or swam in its artificial pool. When it, some time afterwards, died the skin was courteously forwarded to me by Mr. Bartlett, the Superintendent of the Gardens, for more critical examination. About the same time I received from Sir James Hector a Penguin preserved in spirit (also from the Auckland Islands), which proved to belong to the same form; and on a careful comparison of these specimens with a good series of New-Zealand examples in my own collection, I came to the conclusion that the Auckland-Island bird was a new species, distinguishable from the former by its larger size, by the peculiar character of its superciliary streak, and by the different coloration of its flippers.

It having thus become necessary to select a distinctive name for this bird, I felt that I could not do better than dedicate it to Dr. Sclater, who was the real discoverer of this species, and I accordingly described it, under the name of *Eudyptes sclateri*, in my 'Birds of New Zealand' (2nd ed. vol. ii. p. 289).

In this species the superciliary streak of golden yellow, which, as in *Eudyptes pachyrhynchus*, develops into a short erectile crest on each side of the head, instead of commencing in a line with the nostrils, as in the latter species, springs from the base of the upper mandible immediately above the angle of the mouth. The posterior edge of the flippers, in its middle portion, has a border of white nearly ·25 of an inch in width running off on both sides to a point, the under surface in its basal and apical portion, with a broad connecting band along the anterior edge, being jet-black. The bill is uniform reddish brown, with a line of white along the base of the lower mandible, which is more conspicuous in the living bird than in the dried specimen, being somewhat concealed in the latter by the overlapping feathers. The total length is 28 inches; length of flipper 8; tail 3·5; bill, along the ridge 2·4, along the edge of lower mandible 2·75; tarsus 1·25.

The synonymy of these three species, according to my views, is as follows:—

1. EUDYPTES PACHYRHYNCHUS. (Plate IX. fig. 2.)

Eudyptes pachyrhynchus, Gray, Voy. Ereb. & Terr., Birds, p. 17 (1844).

Chrysocoma pachyrhynchus, Bonap. C. R. xliii. p. 775 (1856).

Eudyptes pachyrhyncha, Gray, Hand-l. of B. iii. p. 98 (1871).

Eudyptes chrysocomus, Buller, Birds of New Zealand, 1st edition, p. 344 (1873).

Eudyptes chrysocoma, Sharpe, App. Voy. Ereb. & Terr. p. 35 (1875).

Eudyptes pachyrhynchus, Buller, Manual Birds of N. Z. p. 100 (1882); Birds of New Zealand, 2nd ed. vol. ii. p. 286 (1888).

2. EUDYPTES SCLATERI. (Plate IX. fig. 1.)

Eudyptes chrysocome, Sclater, Zool. Soc. Register (1888, *nec* Forst.).

Eudyptes sclateri, Buller, Birds of New Zealand, 2nd ed. vol. ii. p. 289 (1888).

Similis E. pachyrhyncho, *sed major et fascia superciliari a rictu oris minime a basi narium oriente: alis subtus magis extense nigricantibus.*

3. EUDYPTES CHRYSOCOME.

Aptenodytes chrysocome, Forst. Comm. Soc. Reg. Gott. iii. p. 135 pl. i. (1781).

Chrysocoma saltator, Stephens, Gen. Zool. xiii. p. 58, pl. 8 (1826).

Catarractes chrysocome, Brandt, Bull. Ac. Pét. ii. p. 314 (1837).

Eudyptes chrysocome, Gould, Birds of Australia, vol. vii. pl. 83 (1848).

Eudyptes nigrivestis, Gould, P. Z. S. 1860, p. 418.

Eudyptes chrysocome, Scl. P. Z. S. 1860, p. 390.

Spheniscus chrysocome, Schl. Mus. Pays-Bas, *Urinat.* p. 6 (1866).

Eudyptes nigriventris, Gray, Hand-l. of B. iii. p. 98 (1871, err.).

Eudyptes saltator, Sharpe, Zool. Kerg., Phil. Trans. R. S. vol. 168. p. 158 (1879).

Eudyptes filholi, Hutton, Proc. Linn. Soc. N. S. W. vol. iii. p. 334 (1879).

Eudyptes chrysocome, Buller, Birds of New Zealand, 2nd ed. vol. ii. p. 290 (1888)

March 5, 1889.

Professor Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1889:—

The total number of registered additions to the Society's Menagerie during the month of February was 90, of which 62 were by presentation, 3 by birth, 16 by purchase, and 9 on deposit. The total number of departures during the same period, by death and removals, was 87.

The most noticeable additions during the month were:—

1. A collection of Reptiles from the Cape Colony, presented, as have been many previous collections, by our Corresponding Member the Rev. G. H. R. Fisk. Amongst these are seven specimens of the new Tortoise, *Homopus femoralis*, lately described by Mr. Boulenger (P. Z. S. 1888, p. 251, pl. xiv.), and two of *Homopus signatus*, a species not previously received.

2. Four Marbled Polecats (*Putorius sarmaticus*), obtained in the vicinity of Quettah, presented by Col. Sir Oliver B. C. St. John, K.C.S.I., R.E., F.Z.S., February 8th.

This well-marked species is rare in most museums and quite new to the Society's collection.

3. A fine specimen of Owen's Apteryx (*Apteryx oweni*) from the South Island of New Zealand, presented by Prof. T. Jeffery Parker, C.M.Z.S., 19th February, 1889.

It is now several years that specimens of the Apteryx have been deficient to the collection. We are therefore very glad to receive the present example from our excellent Correspondent.

Prof. G. B. Howes, F.Z.S., exhibited and made remarks on a specimen of the mammary region of a female of *Myrmecobius fasciatus*, which showed four teats and a small embryo attached to each of them. The animal had been obtained at Morgans on the N.W. bend of the Murray River, and forwarded to Prof. Howes by Dr. E. Stirling, Curator of the Adelaide Museum.

Mr. O. Thomas exhibited a specimen of a new species of Muntjac, recently discovered in the neighbourhood of Mount Mouleyit, Tenasserim, by Signor L. Fea, of the Museo Civico, Genoa, and proposed to be called *Cervulus feæ*. This Muntjac differed from its nearest ally *C. crinifrons*, Sclater[1], by its unbushed forehead, shorter tail, and by the presence of a white stripe down the front of its thighs.

Mr. Arthur Thomson exhibited a series of Insects reared in the

[1] P.Z.S 1885, p. 1, pl. i.

Insect-house in the Society's Gardens during the past year, and re the following Report on the subject.

Report on the Insect-house for 1888.

Examples of the following species of insects have been exhibit in the Insect-house during the past season :—

Silk-producing Bombyces and their Allies.

Indian.

Attacus atlas.
—— *pernyi.*
—— *roylei.*
—— *cynthia.*
—— *ricini.*
Actias selene.
Antheræa mylitta.
Cricula trifenestrata.

American.

**Attacus hesperus.*
Actias luna.
Telea polyphemus.
—— *promethea.*
Samia cecropia.
Dirphia tarquinia.
Hypochera io.

African.

Antheræa menippe.

Diurnal Lepidoptera.

European.

Papilio machaon.
—— *podalirius.*
Thais polyxena.
Euchloë cardamines.
Vanessa antiopa.
—— *io.*
—— *atalanta.*
—— *cardui.*
Vanessa polychlorus.
—— *levana.*
Argynnis paphia.
Limenitis sibylla.
—— *populi.*
Melanargia galathea.
Apatura iris.

American.

Papilio ajax.
—— *asterias.*
—— *troilus.*
Papilio turnus.
—— *cresphontes.*

Nocturni.

Smerinthus populi.
—— *tiliæ.*
—— *quercus.*
Sphinx ligustri.
—— *pinastri.*
*—— *quinquemaculata.*
**Pterogon clarkiæ.*
**Bombyx calunæ.*
*—— *rhadama.*
**Alaria gaurae.*
Callimorpha dominula.
Endromis versicolor.

* Exhibited for the first time.

Deilephila euphorbiæ.	*Saturnia pyri.*
—— *galii.*	*Ennomos angularia.*
—— *vespertilio.*	*Pygæra bucephala.*
Chærocampa elpenor.	*Clostera anachoreta.*
Macroglossa bombyliformis.	*Eacles imperialis.*

Of the Silk-producing Bombyces, one very beautiful species, *Attacus hesperus*, from Brazil, was exhibited for the first time. The cocoons from which these insects were produced were deposited in the Insect-house by the Hon. Walter Rothschild, F.Z.S., on the 29th of June last. The first perfect insect emerged next day, 3 on the 1st, 2 on the 2nd, 1 on the 5th, 1 on the 6th, 3 on the 7th, 1 on the 13th, 1 on the 20th, and 1 on the 23rd of July, and with one exception were all good specimens. I exhibit the whole series (13) this evening. It will be observed that seven of these insects are lighter-coloured than the other six. These agree with the specimens of *A. hesperus* in the British Museum. Whether the dark-coloured ones are of another species, or a dark variety, I have not been able to make out, but I could not find any in the British Museum like them.

During the past season we have had an excellent exhibition of the great Atlas Moth (*Attacus atlas*) and the Tusseh Silk-Moth (*Antheræa mylitta*). The last Atlas Moths (2) emerged on the 14th of November last. For the cocoons, of which a large number were sent, the Society are indebted to the kind assistance of Messrs. Wood-Mason and W. L. Sclater, of the Indian Museum, Calcutta.

I exhibit this evening a series of *Antheræa mylitta* of both sexes. This species is well known to be an extremely variable one, but, out of the many I have seen, I do not remember to have seen one like the female placed at the top. It has been suggested that it must be of a distinct species: this, however, can hardly be the case, as the cocoons (which came from Assam) were certainly all alike, and it was impossible to pick out the cocoon from which this particular specimen emerged. As will be seen, the markings round the "eyes" are much extended towards the thorax.

Amongst the Diurnal Lepidoptera I exhibit two remarkable varieties of *Vanessa antiopa*. I have had from time to time a very large number of these insects in the Insect-house, but this is the first time I have obtained any varieties. The first specimen, it will be noticed, has the marginal blue spots on the *fore wings only*, and in the second specimen the blue spots are *entirely absent* on all four wings.

I am sorry that I cannot report the successful rearing of any larvæ of interest during the past season; the weather was so unfavourable that I was unable to rear many of the common and hardy species.

The following papers were read:—

1. Descriptions of new South-American Coleoptera of the Genus *Diabrotica*. By Joseph S. Baly, F.L.S.

[Received February 15, 1889.]

Section I.—Fourth joint of antennæ equal in length to the preceding two united.

1. Diabrotica contigua, sp. nov.

Elongata, postice ampliata, convexa, flava, nitida; pectore, scutello capiteque nigris, antennis basi et apice flavis; thorace leviter trifoveolato, interdum piceo tincto; elytris sat crebre punctatis, sulcis longitudinalibus nonnullis leviter impressis, costa subhumerali fere ad apicem extensa, utrisque linea suturali, ante apicem abbreviata, apice paullo ampliata, vitta humerali a basi fere ad apicem extensa, maculaque discoidali pone medium nigris.

Long. 3 lin.

Hab. Brazil.

2. Diabrotica melanopyga, sp. nov.

Elongata, postice paullo ampliata, convexa, flava, nitida; pectore, abdominis apice, tibiis et tarsis posticis necnon capite nigris, antennis basi et ante apicem flavis; thorace bifoveolato, scutello, tibiis tarsisque quatuor anticis piceis; elytris subcrebre punctatis, utrisque linea suturali, postice attenuata et ante apicem obsoleta, macula parva apicali vittaque humerali fere ad apicem extensa, nigris.

Long. 2¾ lin.

Hab. Brazil.

3. Diabrotica extensa, sp. nov.

Subelongata, postice ampliata, convexa, flava, nitida; pectore, oculis, labro antennisque (his apice exceptis) nigris; thorace leviter excavato, utrinque obsolete foveolato; elytris subrugulosis, sat crebre punctatis, obsolete longitudinaliter sulcatis, costa subhumerali fere ad apicem extensa, utrisque linea suturali, postice abbreviata, vittaque sublaterali super costam humeralem posita, nigris.

Long. 2¾ lin.

Hab. Brazil.

4. Diabrotica nitidicollis, sp. nov.

Subelongato-ovata, postice paullo ampliata, convexa, flava, nitida; pectore, scutello capiteque nigris, antennis apice flavis; thorace convexo, lævi, fulvo-rufo; elytris leviter sat crebre punctatis, subrugulosis, costa subhumerali longe pone medium extensa, utrisque linea suturali fere ad apicem producta, linea humerali ante apicem abbreviata, maculaque parva discoidali pone medium posita, nigris.

Var. *Elytrorum macula discoidali obsoleta.*

Long. 3 lin.

Hab. Brazil.

5. DIABROTICA CLARKELLA, sp. nov.

Subelongata, postice paullo ampliata, convexa, flava, nitida; pectore antennisque nigris, his basi et apice fulvis; thorace excavato, utrinque foveolato; elytris crebre punctatis, obsolete rugulosis, costa subhumerali modice elevata, sulco longitudinali intus marginata, utrisque basi vittis duabus brevibus (una suturali, altera humerali) maculisque duabus pone medium, oblique transversim positis, nigris.

Long. 3½–4 lin.

Hab. Brazil.

6. DIABROTICA SCUTELLATA, sp. nov.

Subelongato-ovata, postice ampliata, convexa, flava, nitida; oculis scutelloque nigris, pectore, ore antennisque piceis; thorace leviter bifoveolato; elytris sat crebre punctatis, costa humerali longe ultra medium extensa, utrisque vitta submarginali super costam posita, picea, sutura piceo tincta.

Long. 3 lin.

Hab. Brazil.

7. DIABROTICA PICEICORNIS, sp. nov.

Anguste ovata, postice paullo ampliata, convexa, flava, nitida, plus minusve viridi tincta; antennis pallide piceis, oculis nigris; thorace bifoveolato elytrisque pallide prasinis, his tenuiter subcrebre punctatis, disco exteriore obsolete longitudinaliter sulcatis, tarsis piceis.

Long. 3 lin.

Hab. Brazil.

8. DIABROTICA VIRIDANS, sp. nov.

Subelongata, postice paullo ampliata, convexa, prasina, nitida; antennis, pectore abdomineque pallide piceis, pedibus flavo-viridibus, thorace convexo, fere impunctato; elytris sat crebre punctatis, disco exteriore sulcis nonnullis longitudinalibus leviter impressis.

Long. 2½ lin.

Hab. Brazil.

9. DIABROTICA GLAUCINA, sp. nov.

Anguste ovata, postice ampliata, convexa, sordide fulva, nitida; labro et antennis piceis aut nigro-piceis, his basi fulvis, ante apicem flavo-albidis, articulo apicali nigro; thorace convexo; elytris tenuiter subcrebre punctatis, disco exteriore ante medium plicatis, longitudinaliter sulcatis, utrisque pustulis magnis quatuor, longitudinaliter positis, fulvis, duabus anticis plerumque confluentibus.

Long. 5 lin.

Hab. Cayenne.

10. Diabrotica atromaculata, sp. nov.

Anguste oblongo-ovata, convexa, flava, nitida; pectore, scutello capiteque nigris; antennis flavis, articulis intermediis piceis; thorace lævi; elytris crebre punctatis, utrisque macula basali communi, plaga magna humerali, trigonata, intus profunde emarginata, fasciaque pone medium, utrinque abbreviata, postice emarginata, nigris.

Long. $2\frac{2}{3}$ lin.

Hab. Amazons.

11. Diabrotica 12-signata, sp. nov.

Anguste ovata, postice paullo ampliata, convexa, sordide fulva, subnitida; pectore capiteque nigris, antennis basi et apice labroque fulvis; thorace nitido scutelloque rufo-testaceis; elytris crebre punctatis, utrisque vittulis sex, 2. 2. 2 dispositis, nigris.

Long. $2\frac{3}{4}$ lin.

Hab. Brazil.

12. Diabrotica vagrans, sp. nov.

Anguste ovata, postice ampliata, convexa, nigra, nitida, abdomine thoraceque flavis; thorace convexo, lævi; elytris crebre punctatis, flavis, sutura basi necnon vittis vel vittulis irregularibus nigris.

Long. $2\frac{1}{2}$ lin.

Hab. Bolivia.

13. Diabrotica ægrota, sp. nov.

Oblongo-ovata, postice ampliata, convexa; subtus flava, nitida, pectore, ano, tibiis tarsisque nigris; supra subnitida, pallide viridi-flava, scutello capiteque nigris, antennis basi piceis, ante apicem flavo-albidis; thorace transversim convexo, lævi; elytris crebre punctatis, subrugulosis.

Long. 4 lin.

Hab. Ecuador.

14. Diabrotica evanescens, sp. nov.

Anguste ovata, postice paullo ampliata, convexa, pallide viridi-flava, abdomine flavo; pectore, tibiis, tarsis, scutello capiteque nigris, antennis basi piceis; thorace bifoveolato; elytris subnitidis, crebre punctatis, sordide flavis, fascia lata prope medium prasina, sutura basi nigra.

Long. 3 lin.

Hab. Ecuador.

15. Diabrotica confraterna, sp. nov.

Oblongo-elongata, postice paullo ampliata, convexa, flava, nitida; pectore capiteque nigris, antennis basi piceis, apice sordide fulvis; thorace rufo-fulvo, obsolete trifoveolato; elytris sat crebre punctatis, costa subhumerali vix elevata, utrisque vitta brevi communi ad basin, una humerali a basi ad longe pone medium extensa, maculaque parva inter medium et apicem, nigris.

Long. $2\frac{1}{2}$–3 lin.

Hab. Para.

16. Diabrotica limitata, sp. nov.

Ovata, postice ampliata, convexa, flava, nitida; pectore, tibiis, tarsis capiteque nigris; antennis basi piceis, apice albidis; thorace flavo-rufo, disco late excavato, leviter trifoveolato, fovea intermedia minus distincta, interdum obsoleta; scutello piceo; elytris sat crebre punctatis, pallide flavis, utrisque linea suturali et vitta submarginali, apicem versus abbreviatis, necnon lineis duabus transversis, una vix ante medium, secunda inter medium et apicem, plerumque cum vitta submarginali connexis, nigris.

Long. 4 lin.

Hab. Eastern Ecuador.

Section II.—Third joint of antennæ equal in length or nearly so to the fourth.

17. Diabrotica tuberculata, sp. nov.

Sat late ovata, postice paullo ampliata, convexa, subtus cum scutello capiteque nigris, antennis apice sordide fulvis; thorace elytrisque flavis, illo arcuatim excavato, et utrinque puncto nigro parvo notato, his tenuiter punctatis, utrisque plagis magnis duabus, una ad basin, altera pone medium nigris.

Mas. *Elytris ante apicem juxta suturam tuberculo conico valido instructis.*

Long. 3 lin.

Hab. Eastern Ecuador.

18. Diabrotica hemixantha, sp. nov.

Ovata, postice ampliata, convexa, nigra, nitida; femoribus basi, thorace elytrorumque dimidio antico flavis; thorace leviter transversim sulcato; elytris distincte punctatis, punctis apicem versus fere obsoletis.

Var. *Pedibus totis nigris.*

Long. 3 lin.

Hab. Upper Amazons.

19. Diabrotica interrupto-lineata, sp. nov.

Ovata, postice ampliata, convexa, fulvo-flava, nitida; pectore, scutello, capitis vertice, ore antennisque nigris, his apice albidis; thorace lævi; elytris crebre punctatis, flavis, utrisque linea discoidali, infra basin late interrupta et longe ante apicem abbreviata, alteroque sublaterali, a basi fere ad apicem extensa, nigris.

Long. 3½ lin.

Hab. Brazil.

20. Diabrotica notaticollis, sp. nov.

Anguste ovata, postice ampliata, convexa, flava, nitida; pectore, femoribus, dorso, tibiis posticis, tarsis, antennis (basibus exceptis),

verticis macula, thoracis maculis quatuor, arcuatim dispositis scutelloque nigris ; thorace trifoveolato ; elytris sat crebre punctatis, utrisque macula oblonga fusca infra basin juxta suturam, plagisque tribus, prima subrotundata callum humeralem amplectente duabusque transverso-oblongis, una prope, altera inter medium et apicem positis, nigris.

Long. 2 lin.

Hab. Brazil.

21. DIABROTICA MELANCHOLICA, sp. nov.

Anguste ovata, postice ampliata, convexa, nigra, nitida, femorum basi antennarumque articulo apicali albidis ; thorace transverso, pone medium bifoveolato, nigro-piceo ; elytris subrugulosis, sat crebre punctatis, punctis apicem versus fere obsoletis, utrisque limbo externo apice paullo ampliato, punctoque juxta suturam prope medium, albidis.

Mas. *Antennarum articulis duobus apicalibus compresso-dilatatis.*

Long. 2 lin.

Hab. Ecuador.

22. DIABROTICA ZONULA, sp. nov.

Sat late ovata, postice ampliata, modice convexa, nigra, nitida, antennis extrorsum albidis; thorace flavo-fulvo, obsolete bifoveolato; elytris minus crebre punctatis, limbo externo, apice paullo ampliato fasciaque prope medium flavo-fulvis.

Long. 3 lin.

Hab. Ecuador.

23. DIABROTICA UNIFASCIATA, sp. nov.

Late ovata, postice ampliata, modice convexa, dorso subdeplanata, nigra, nitida ; thorace albido, obsolete bifoveolato ; elytris tenuiter remote punctatis, limbo externo, apice ampliato fasciaque prope medium albidis.

Long. 3 lin.

Hab. Peru.

Distinguished from the preceding species by the unicolorous antennæ and the nearly impunctate elytra.

24. DIABROTICA SPILOPTERA, sp. nov.

Anguste ovata, postice ampliata, convexa, nigra, nitida ; femoribus, abdomine (hoc piceo tincto) elytrisque flavis, his minus crebre punctatis, utrisque plagis tribus, prima infra callum humeralem trigonata, secunda prope medium transversa, tertiaque pone medium subrotundata, nigris.

Long. 2 lin.

Hab. Brazil.

25. DIABROTICA ALBOMARGINATA, sp. nov.

Late oblongo-ovata, postice ampliata, modice convexa, dorso

subdepressa, nigra, nitida; antennis, basibus exceptis, flavo-fulvis; thorace arcuatim impresso, sulco utrinque magis fortiter impresso; elytris tenuiter punctatis, margine laterali late albido.

Long. 2½ lin.

Hab. Ecuador.

26. DIABROTICA ALBOCINCTA, sp. nov.

Anguste ovata, postice ampliata, convexa, nigra, nitida, thoracis lateribus latis, elytrorum limbo externo apice dilatato, fasciaque angusta vix pone medium albidis; thorace bifoveolato.

Long. 2½ lin.

Hab. Peru.

27. DIABROTICA ALBOPICTA, sp. nov.

Anguste ovata, postice ampliata, convexa, flavo-fulva, nitida; tibiis, tarsis, pectore, scutello capiteque nigris; antennis basi piceo-fulvis, articulis penultimis duobus albidis; thorace leviter trifoveolato; elytris subrugulosis, rude punctatis, nigris, utrisque macula infra basin, altera ante apicem fasciaque prope medium, utrinque abbreviata, albidis.

Long. 2½ lin.

Hab. Peru.

28. DIABROTICA LIMBATIPENNIS, sp. nov.

Subelongata, postice vix ampliata, convexa, nigra, nitida, femoribus basi elytrorumque limbo externo flavo-albidis; thorace quam longus fere duplo latiore, vix pone medium bifoveolato; elytris sat crebre punctatis, punctis apicem versus minus fortiter impressis.

Long. 2 lin.

Hab. Brazil.

29. DIABROTICA COGNATA, sp. nov.

Late ovata, postice sat valde ampliata, convexa, dorso subdepressa, fulva, nitida; pectore, scutello capiteque nigris; thorace bifoveolato, fortiter punctato; elytris subseriato-punctatis, utrisque tricostatis, nigris, limbo externo fulvo; pedibus anticis quatuor piceo tinctis.

Long. 4 lin.

Hab. Ecuador.

30. DIABROTICA SIMULANS, sp. nov.

Late ovata, postice vix ampliata, modice convexa, dorso subdepressa, nigra, nitida, thorace capiteque fulvis, antennis nigris, extrorsum albidis; thorace transverso, sat profunde bifoveolato, foveis inter se connexis; elytris tenuiter subcrebre punctatis, infra basin non excavatis, limbo externo late fulvo.

Long. 2½ lin.

Hab. Amazons.

31. Diabrotica perspicua, sp. nov.

Oblongo-ovata, postice paullo ampliata, convexa, flavo-fulva, nitida; antennis basi piceis, apice fulvis; thorace late transversim impresso, sulco utrinque magis fortiter excavato; elytris crebre punctatis, nigris, limbo externo fasciaque prope medium flavo-fulvis.

Var. A. *Elytrorum fascia obsoleta.*

Long. 2½ lin.

Hab. Amazons.

32. Diabrotica alcyone, sp. nov.

Late ovata, modice convexa, fulva, nitida; pedibus (femoribus apice exceptis) antennisque piceo-nigris, his extrorsum piceis; thorace bifoveolato; elytris tenuiter sed distincte punctatis, nigris, limbo externo fasciaque prope medium fulvis.

Var. *Elytrorum fascia obsoleta.*

Long. 3½ lin.

Hab. Amazons.

33. Diabrotica stali, sp. nov.

Late ovata, modice convexa, fulvo-flava, nitida; antennis nigris, apice albidis; tibiis tarsisque piceo tinctis; thorace obsolete bifoveolato; elytris tenuiter punctatis, utrisque infra medium transversim impressis, nigris, apicibus flavis.

Long. 3½ lin.

Hab. Amazons.

34. Diabrotica suaveola, sp. nov.

Anguste ovata, postice paullo ampliata, convexa, fulva, nitida; tibiis, tarsis, pectore capiteque nigris; antennis piceo-nigris, basi fulvo-piceis, ante apicem albidis; thorace arcuatim sulcato, sulco utrinque fovea magna male definita impresso; elytris metallico-viridibus, limbo externo, apice late ampliato, fascia prope medium suturæque dimidio postico flavis.

Long. 2¾ lin.

Hab. Cayenne.

35. Diabrotica discrepans, sp. nov.

Oblongo-ovata, postice paullo ampliata, convexa, nigra, nitida, thorace capiteque sordide rufis; pedibus antennisque flavis, his apice piceis; thorace minute sed distincte punctato, sulco semilunato, medio ramulum fere ad basin emittente, impresso; elytris subcrebre punctatis, utrisque limbo externo ante medium, margine apicali, fasciaque prope medium flavis.

Fœm. *Clypeo quam longus latiore, medio sat fortiter elevato-vittato.*

Long. 2¾ lin.

Hab. Ecuador.

36. DIABROTICA ÆNEIVENTRIS, sp. nov.

Anguste ovata, postice ampliata, convexa, nigro-ænea, nitida; tibiis, tarsis, scutello capiteque nigris; antennis basi piceo-fulvis, articulis externis quatuor, ultimi (apice excepto) pallide flavis; thorace trifoveolato femoribusque flavis, his nigro lineatis; elytris tenuiter, sat crebre punctatis, viridi-æneis, utrisque limbo externo, maculis duabus infra basin positis, fascia curvata vix pone medium, utrinque abbreviata, maculaque subapicali ad limbum adfixa, flavis.

Long. 5 lin.

Hab. Ecuador.

37. DIABROTICA BIPARTITA, sp. nov.

Oblonga, postice ampliata, convexa, flava, nitida; capite thoraceque nigris, hoc transversim sulcato, basi anguste piceo; antennis flavis, articulis primo et intermediis nigris; elytris postice paullo ampliatis, convexis, infra basin excavatis, sat crebre punctatis, disco antico, limbo externo excepto, fasciaque angusta vix pone medium viridi-æneis, spatio inter hanc fasciam et discum anticum elevato.

Mas. *Elytris ante apicem juxta suturam vitta brevi elevata instructis.*

Long. 4 lin.

Hab. Ecuador.

38. DIABROTICA ERYTHROPTERA, sp. nov.

Ovata, postice ampliata, convexa, nigra, nitida, elytris rubris; thorace arcuatim sulcato, sulco trifoveolato; elytris crebre punctatis.

Long. 3½ lin.

Hab. Peru.

39. DIABROTICA ALBIDO-VITTATA, sp. nov.

Ovata, postice paullo ampliata, convexa, nigro-picea, nitida, femoribus basi flavis, capite thoraceque piceo-rufis; antennis nigris, articulis octavo nonoque albidis, thorace profunde bifoveolato; elytris piceo-nigris, subnitidis, elevato-vittatis, costa tertia a sutura latiore, utrisque limbo externo costaque tertia albidis, apicibus confluentibus.

Long. 3 lin.

Hab. Brazil.

These descriptions are all based upon specimens in my own collection.

2. Descriptions of new Species and of a new Genus of Coleoptera of the Family *Telephoridæ*. By the Rev. H. S. Gorham, F.Z.S.

[Received March 5, 1889.]

(Plate X.)

The object of this paper is to contribute something to our knowledge of the Malacodermata pertaining to the genus *Telephorus* and its near allies from Eastern Asia, with the exception of the Japanese species, which are already pretty well known and a revision of which will appear in a separate paper. The material in my hands for the purpose consists of:—(I.) My own collection from various sources, which I have been forming for many years. (II.) The collection of the Imperial Museum at Calcutta, of which the whole of the Malacodermata have been placed in my hands for determination; these are for the most part old specimens, chiefly from the North-east Frontier. (III.) A collection made by Mr. A. E. Pratt near Kiukiang for Mr. Leech, and many specimens collected by Mr. Leech himself in China and Korea. And (IV.) I have to thank M. R. Oberthür for examples of a few most interesting species from Thibet and from Mt. Kodeicanel in Southern India.

With regard to the question of the genera to which Eastern Telephoridæ should be referred, I have dissected many of the species and the result I arrive at is that the majority belong to that section of *Telephorus* which has in Europe received the name of *Ancistronycha*; but the study of the male genitalia is hardly yet advanced enough for me to form an opinion as to whether all the species which are *Ancistronychæ* by the structure of the claws should be retained in that genus, or whether it would simplify their classification to form new genera based upon the other structures of the male. It must be borne in mind that Malacodermata have been so little collected, and are frequently only available in such bad condition, through age, and are so apt to shrivel that the study of the ventral appendages is attended with much difficulty. Still I have been able to do something in this way, and hope to present some remarks with drawings. *Telephorus* proper is a genus confined to the Palæarctic and Nearctic Regions of the globe, reaching its highest development in the Eastern parts of the former district, and among the species described in this paper are some of the largest and most brilliant of the whole Family. One new genus is now proposed for some very abnormal species from India, which have also representatives in China.

1. Telephorus chalybeipennis, sp. nov. (Plate X. fig. 2.)

Castaneo-fulvus, nitidus; antennis articulis quatuor ultimis tarsisque nigro-fuscis; elytris chalybæis vel nigris, pernitidis, subtiliter coriaceis.

Long. 18 millim. ♂ ♀.

NEW SPECIES OF TELEPHORIDÆ.

Hab. India, Kullu (*Mus. Calcutta*), Koa Deyring; Assam.

Head broad and flat, very smooth and even, minutely punctured, entirely yellow, apices of the mandibles pitchy; antennæ more than half as long as the body, thin, and simple, pale luteous, with the last four joints black. Thorax square, glabrous, yellow, without a trace of a central channel, the front and sides not reflexed, the base finely margined. Scutellum and the entire body beneath yellow; elytra brilliant steel-blue, closely and very finely punctured at the shoulders, this sculpture gradually terminating in the fine wrinkles which cover the surface. The elytra of this species (like those of *T. nepalensis*, Gray) seem of a very delicate texture and easily become shrivelled. Legs yellow with black tarsi.

This insect is narrower than *T. nepalensis* and has the tibiæ yellow.

2. TELEPHORUS KHASIANUS, sp. nov. (Plate X. fig. 1.)

Flavus; capitis basi et macula duplici frontali nigro-subviridibus, prothorace disco nigro; elytris viridibus creberrime granulatis, apicibus tenuiter flavis.

Long. 15–16 millim. ♀.

Hab. India, Khasia Hills, 2000 feet elevation (*Major Godwin-Austen*); Shillong.

Head finely punctured and wrinkled, clypeus yellow, roughened and irregular, behind the insertion of the antennæ greenish and not very shining, antennæ entirely yellow. Thorax wider than long, yellow excepting the disk, which is broadly black with a greenish reflexion, sides and base reflexed. Legs yellow, front coxæ a little infuscate in front. Elytra rather dull, but beautiful green, owing to the fine granulations, narrowed towards their tips, which are yellow. Body beneath entirely yellow.

Allied to the Japanese *T. viridipennis*, Kiesen. Two specimens in my own collection; several examples in the Museum of Calcutta.

3. TELEPHORUS VERSICOLOR, sp. nov.

Luteus, tibiarum apicibus tarsisque fuscis; elytris violaceo-cæruleis, tertia parte apicali luteis, grosse cribrato-punctatis, basi apiceque lævigatis.

Long. 12 millim.

Hab. India, Khasia Hills, 3000 feet elevation.

Head and thorax luteous yellow; mouth, palpi, and two basal joints of the antennæ (the rest being lost) of the same colour, tips of the mandibles infuscate. The thorax is nearly square and its margins gently reflexed, both it and the head are impunctate. Elytra steel-blue at the base, passing into violet, the base is glabrous beyond the shoulders, as far as the apical yellow portion coarsely and cellularly punctate; a few obsolete cells extend on the yellow apical part, which is more than a third of their length. Scutellum yellow, but metallic blue at the base. Legs and underside yellow, apices of the tibiæ and the tarsi fuscous.

A single specimen, the antennæ are lost with the exception of two joints.

4. TELEPHORUS BRAHMINICUS, sp. nov.

Fulvus; antennis, palporum articulo ultimo pedibusque nigris, his basi fulvis; elytris nigro-cæruleis, subnitidis, granuloso-rugosis.

Long. 12 millim.

Hab. India, Assam.

Head and thorax fulvous, impunctate, finely pubescent; antennæ entirely black. Thorax rather narrower in front than at the base, the margins very little reflexed, the disk channelled, and rather tumid on each side of the centre, transversely impressed in front. Scutellum red. Elytra rather rugulose, not shining except at their base; underside yellow. Legs black, excepting the coxæ, the trochanters, and the inner side of the femora at the bases.

Two specimens in my own collection, one in the Calcutta Museum.

Obs. In one of these the antennæ are lost except the two basal joints, which are fulvous beneath.

5. TELEPHORUS CRURALIS, sp. nov.

Fulvus; antennis (articulis duobus primis exceptis), palporum apicibus, tibiis tarsisque nigris; elytris plumbeo-cæruleis, subpubescentibus, subtiliter rugulosis.

Long. 12 millim.

Hab. India, Dibru.

Head and thorax fulvous, impunctate, sparingly pubescent, the latter with its sides considerably narrowing from the base, and with a slight constriction before the front margin; the disk smooth and shining, not channelled but uneven, and almost tubercularly elevated on each side of the middle; the base finely margined, the sides not reflexed at all, towards the hind angles with longer thicker pubescence. Scutellum red. Elytra dull leaden blue, almost black; the shoulders highly carinate, shining. Body beneath and legs yellow; tibiæ and tarsi black. The hind tibiæ slightly bent.

A single specimen in my own collection.

6. TELEPHORUS VIATOR, sp. nov.

Niger; capite, prothorace elytrisque luridis, coxis interne et abdominis segmentis quinque basalibus flavo-marginatis.

Long. 12 millim.

Hab. India, Khasia Hills, 2000 feet elevation.

Head and thorax fulvous, impunctate, shining; antennæ black, basal joint yellow beneath; tips of the mandibles and palpi fuscous. Thorax narrowed in front from the base, not distinctly channelled, but tumid on each side of the middle, a little constricted near the front, the sides (as in *T. cruralis*) not reflexed. Scutellum yellow, infuscate at the base. Elytra dull ochraceous, thickly pubescent, with scarcely any sculpture. Underside and legs greyish black; tips of the coxæ and margins of the abdomen yellow.

One specimen.

Var.? Body beneath, coxæ, trochanters, and base of the thighs yellow.

Hab. Khasia Hills. One specimen.

I cannot from the single specimens before me determine whether these are distinct species, the structure appears to be the same in both.

7. TELEPHORUS SEMIUSTUS, sp. nov.

Nigro-subcinereus; capitis fronte, antennarum articulo primo, prothorace femoribusque anticis et intermediis basi flavis; elytris sordide lividis, pubescentibus, basi nitidis nigro-plumbeis.

Long. 9–10 millim.

Hab. India: Assam, Sibsaugor (*Major Godwin-Austen*).

A feebly built, soft-looking species, which will be easily recognized by its peculiar coloration. The head is black and shining, the front from the insertion of the antennæ, and underside excepting the cheeks, yellow; the antennæ ashy grey, yellowish at the base, the palpi fuscous. The thorax is suborbiculate, wider than long, impunctate and shining, the lateral margins and the base gently reflexed. The elytra appear to be very soft in texture, being shrivelled in all the specimens; they are granulosely-subrugose, of a pale sordid yellow, indeterminately black at the base, the rather strongly raised shoulders being shining black. The body is ashy grey, the abdomen nearly black. Legs black, the front coxæ and femora excepting at their tips, and the middle femora at the base for half the length, and their coxæ internally, yellow.

Three specimens in my own collection, and one in the Calcutta Museum.

8. TELEPHORUS STYGIANUS, sp. nov.

Ater, nitidus; elytris subrugulosis, sutura margineque laterali tenuissime albis; abdominis segmentis singulis albo-marginatis.

Long. 7½ millim. ♂ ♀.

Mas. *Segmentis tribus ultimis ventralibus divisis et imbricatis, prothoracis margine laterali infra medium plicato.*

Fem. *Segmento sexto ventrali bifossulato et lævigato.*

Hab. South India (*Mus. Calcutta*), Mt. Kodeicanel (*J. Castets*).

The antennæ are rather long in the male, being about the length of the body, those of the female are shorter. The mandibles are pitchy red. The thorax about as long as wide, none of the angles distinct, but the margin is raised and a little thickened at the front, plicate a little below the middle of the side, forming in the male a narrow notch, below which the margin is bidentate; but this structure is not apparent in one of the two specimens of that sex nor in the female. The apical ventral plates of the male have their two halves somewhat inclined so as to form a V, and are divided in the middle much as in the Central-American genus *Discodon*, Gorh. It is probable that a new genus will have to be proposed for the present insect and its allies in the east.

9. TELEPHORUS SEMIFULVUS, sp. nov.

Ater, nitidus; elytris subrugosis, dimidio basali sordide ochraceis, prothorace quadrato, medio late fossulato.

Long. 6 millim.

Hab. South India, Mt. Kodeicanel (*Castets*).

The head and thorax are black and shining, the mandibles and front of the clypeus are obscurely red. The thorax is small, square with all the angles distinct; the elytra are narrow, a little wider than the thorax, shining, but not smooth, having a subrugose sculpture which is roughest on the black apical half. The legs and body beneath are black, the claws are simple. The antennæ are entirely black, their joints (excepting the short second one) elongate and subequal in length, and not at all serrate.

One specimen.

Obs. This species has the appearance of a small *Rhagonycha*, but is separated by the simple claws.

10. TELEPHORUS MANDUCATUS, sp. nov.

Flavus; antennis, pedibus (tibiarum femorumque basibus præter missis) nigris; elytris nitidis, nigro-fuscis, basi et marginibus lateralibus flavis.

Long. 9 millim.

Hab. India.

The head, thorax, the entire body beneath, the coxæ, trochanters, base of the femora and basal half of the tibiæ, as well as the base of the elytra, with their lateral margins to within about one third of their length at the apex, are yellow. The thorax is wider than long, with its surface even and smooth, the margins a little expanded laterally. The antennæ are entirely black, rather stout and compressed, and about two thirds of the length of the body.

This is a distinct species, for the identification of which the characters above given will, I believe, prove sufficient. I have, however, only seen one example, sent to me by Mr. A. E. Hudd, of Clifton, Bristol, without more particular indication of the locality.

11. TELEPHORUS HUDDI, sp. nov.

Flavus; antennis (basi excepta) tarsisque nigris, elytrorum quarta parte apicali indeterminate nigro-fusco.

Long. 11 millim.

Hab. India.

Head, prothorax, and elytra very smooth, the latter slightly pubescent. Thorax transverse, the sides and front rounded so as to leave no anterior angles; the base nearly straight, finely margined, all the margins a little reflexed. Legs rather robust, hinder tibiæ gently curved, tarsi with their basal joint equal to the next three. Abdomen, body beneath, legs excepting the tarsi entirely clear ochraceous yellow.

This species is only imperfectly known to me, and cannot be fully described at present.

Communicated to me by Mr. A. E. Hudd, with no other locality.

12. TELEPHORUS INSULARIS, sp. nov. (Plate X. fig. 6.)

Flavus; capite, antennis (articulo basali excepto) tarsisque nigro-fuscis; elytris subviridibus granuloso-coriaceis, fere opacis; thorace subquadrato, disco lævi haud canaliculato.

Long. 9–11 millim.

Hab. Andaman Islands (*coll. Gorham*; *Mus. Calcutta*).

Head fuscous, nearly black above; gular portion, mouth, and palpi yellow; antennæ about half the length of the body, their first joint and part of the second yellow. Thorax rather broader than long, smooth, the entire margin rather reflexed, together with the scutellum and whole body and legs, excepting the tarsi, yellow; elytra rather parallel, not much narrowed, of a beautiful bluish green, somewhat opaque and roughened in a granular manner, also clothed with a very short and fine fulvous down. The abdomen is doubly excised at the apex on each side of the middle, but the sex is uncertain; the claws are simple.

13. TELEPHORUS NICOBARINUS, sp. nov.

Flavus; capite supra nigro-fusco, antennis corporis fere longitudine subinfuscatis; ore, palpis et parte gulari testaceis, elytris obscure cærulis, geniculis tarsisque brunneis.

Long. 9 millim.

Hab. Nicobar Islands (*Mus. Calcutta*).

Closely allied to *T. insularis*, and distinguished from it chiefly on account of its smaller size and some differences in the coloration, while at the same time the antennæ appear to be longer. The whole insect is rather more delicately built, and the sculpture of the elytra is finer. There is a series of specimens in the Calcutta Museum, and it seems at least to be an insular form of *T. insularis* peculiar to the Nicobars.

14. TELEPHORUS BIETI, sp. nov. (Plate X. fig. 5.)

Nigro-cæruleus, nitidus; prothorace transversim subquadrato, flavo, disco late nigro-cæruleo, elytris subrugosis cupreo-violaceis, antennis pedibusque nigris.

Long. 15–17 millim. ♂ ♀.

Hab. Thibet, Tàtsienlôu (*F. Biet*).

Head wide, distinctly but finely punctured, the crown with a longitudinal widely impressed channel, with an oblique fossa on each side behind the antennæ, the mandibles are testaceous excepting at their tips. Thorax wider than long, the lateral margins rather widely, the base rather finely, reflexed; the disk shining and glabrous, channelled in the middle, the channel deep behind, obsolete in front, the angles rectangular but not distinct. Elytra much wider than the thorax, thickly and finely coriaceous, dull except at their base, of a beautiful purple or coppery-violet colour. Body beneath blue-black or bronze, the legs black but partaking of the colour of the

body. Antennæ half as long as the body, dull black, the basal joints blue-black and (in the female) the first two yellow beneath.

Two examples sent me by M. R. Oberthür with the name attached which I have adopted.

15. TELEPHORUS THIBETANUS, sp. nov.

Niger, parum nitidus; prothorace flavo, disco late nigro nitido; elytris nitidis, subtiliter subrugose coriaceis, æneis.

Long. 13–14 millim. ♂ ♀.

Mas. *Unguiculo exteriore pedis anterioris ad basin lobo parvulo disciformi.*

Fem. *Iisdem basi hamato-dentatis.*

Hab. Thibet, Tàtsienlôu (*F. Biet*).

Similar in form and build to *T. bieti*, but smaller and with shining instead of dull elytra, which are also differently coloured. The head is more coarsely punctured and is subrugose in front; the mandibles are black, as are the antennæ, only inclining to be pitchy at the apices of some of the basal joints. The thorax is more punctured and its surface more uneven than that of *T. bieti*, the front angles are rounded off; the lateral margins rather widely, the basal margin narrowly, reflexed. The specimen which I think to be the male has the elytra narrower and more parallel; the antennæ are as in *T. bieti*, about half as long as the body.

Two specimens communicated by M. R. Oberthür.

16. TELEPHORUS OBERTHUERI, sp. nov.

Niger, parum nitidus; prothorace (macula discoidali excepta), mesosterno, pedibus (tarsis nigris) antennarum articulo primo, abdominis limbo laterali et apice flavis; elytris viridi-cæruleis, subnitidis, granuloso-subrugosis.

Long. 12 millim.

Hab. Thibet, Tàtsienlôu (*F. Biet*).

Head black, mandibles at their base, and beneath except the cheeks red; crown obsoletely canaliculate, closely and strongly punctured. Thorax as long as wide, with only a few scattered and not deep punctures; disk uneven, reddish yellow with a transverse spot indented in front black, the margins not reflexed, but finely margined behind, as well as the base, the disk tumid and obsoletely canaliculate towards the base. Elytra bluish green, two costæ on each are rather distinct, and their surface is rather more coarsely granulose than in *T. bieti*. Legs red, tarsi black. The inner claw of the anterior pair hamate at their bases.

Two specimens (one is imperfect and the tarsi are missing) from M. R. Oberthür.

17. TELEPHORUS IMPERIALIS, sp. nov. (Plate X. fig. 8.)

Nigro-cæruleus, nitidus; prothorace flavo, subquadrato, maculis duabus nigris, antennis subtus et ad apices ochraceis; abdomine nigro, opaco, luteo-limbato; elytris cæruleis.

Long. 20–23 millim. ♂ ♀.

Hab. China, Kiukiang (*Pratt*).

The general colour of this species is steel-blue, the legs being of the same colour as the body, with the tarsi duller and blacker. The head is large and very shining, without punctuation, excepting that the front edge of the clypeus is rugose; the mandibles are yellow externally at their bases, the palpi are black, the antennæ have two joints at the base shining black, those following are dull, being very finely pubescent, these are fuscous above; all the joints are ochraceous beneath, the three before the apical one being almost entirely ochraceous, and the apical one being black at the tip. The thorax is rectangular, slightly transverse, yellow, smooth and shining, with two roundish black spots on the disk placed near together, but rarely united. In very large females the front of the thorax is a very little wider than the base, and the head is then very large. The elytra are of a deep indigo-blue, dull, being very finely coriaceous, but a little shining at the base; their sides are (when not shrivelled) parallel; the wings blackish.

18. TELEPHORUS NOBILIS, sp. nov. (Plate X. fig. 9.)

Nigro-subviridis, nitidus; prothorace aurantiaco, maculis duabus nigris; antennis fuscis, basi subtus ochraceis, elytris viridibus ad apicem acuminatis; abdomine flavo, utrinque nigro-maculato.

Long. 18–20 millim. ♂ ♀.

Hab. North China (*coll. Gorham*); Fuchau (*Leech*).

This species is allied to *T. imperialis*, but is amply distinct. The head is shining, but is minutely punctured, the mandibles and palpi yellow, but partly pitchy; the antennæ are paler than in *T. imperialis*, and the second joint is only smooth above, the apical joint is quite pale. The thorax in the Fuchau examples (two in number) is of a fine orange-yellow, in the N. China specimen paler yellow; that of the female is wider and distinctly transverse; the two spots as in *T. imperialis*. The elytra are very wide at the base, with very prominent shoulders: at this part and across the base they are very shining and metallic, beyond the middle they are finely and closely rugulose but more shining than in *T. imperialis*. The scutellum is of the greenish-black colour of the metasternum. The legs are bluish black with black tarsi. The abdomen is yellow, the first six segments with a black spot on each side.

There is a specimen in Mr. Leech's collection from Fuchau which is not only much smaller (about 15 millim.), but also differs in having a single discoidal patch on the thorax, and one in my own collection from North China has a subdivided discoidal patch and has blue elytra. These specimens bear therefore somewhat the same relation to *T. nobilis* that *T. regalis* does to *T. imperialis* and may possibly be distinct.

19. TELEPHORUS REGALIS, sp. nov.

Nigro-cæruleus, nitidus; prothorace flavo, subquadrato, disco nigro; antennis subtus et ad apices ochraceis; abdomine nigro, opaco, luteo-limbato; elytris cæruleis.

Long. 18–22 millim. ♂ ♀.

Hab. China, Kiukiang (*Pratt*).

This species is very closely allied to *T. imperialis*, and indeed at first sight only differs from it in having the disk of the thorax with a black patch of irregular shape, indented in front and at each of its hinder angles. It will, however, be found, I believe, to be distinct; it is rather smaller and narrower, and upon dissection of the male the genitalia are found to be dark in colour, and the lateral styles (sagittæ) more widely separated, wider and more hamate. These are differences which are recondite, and do not properly come within the scope of the present paper. About half a dozen specimens of this insect were collected by Mr. Pratt.

20. Telephorus leechianus, sp. nov.

Flavus; capite supra (fronte excepta) nigro-cæruleo; prothoracis disco, femorum apicibus geniculisque nigris; elytris viridibus, basi micantibus; scutello nigro.

Long. 17–18 millim. ♂ ♀.

Hab. Kiukiang (*Pratt*).

Head above behind the insertion of the antennæ blue-black, smooth, with only minute punctures which are furnished with short hairs; front of the head, antennæ, and palpi yellow, tips of the mandibles pitchy. Thorax quadrate, yellow, with a nearly round, not very large, discoidal black patch. Legs and body beneath entirely yellow, excepting that about a third of the femora at the knees and the extreme base of the tibiæ are black. The elytra are bright green, finely granulate, very shining at their bases.

Var.? Thorax with two almost united black spots; elytra blue.

Hab. "North China" (*coll. Gorham*).

This is possibly identical with *T. viridipennis*, Kiesen., from Japan.

21. Telephorus leechianus, var. æneipennis.

Major, latior; elytris æneis, abdomine fusco testaceo-marginato.

Hab. Kiukiang (*Pratt*).

This insect, of which I have only seen one specimen, only differs from *T. leechianus* in having the elytra brassy, less shining at the base, the head quite black at the base instead of being blue-black.

22. Telephorus cœlestis, sp. nov. (Plate X. fig. 7.)

Badius; femorum apicibus, tibiis (duabus posterioribus exceptis) tarsisque nigris; elytris læte cæruleis, nitidis.

Long. 14–18 millim. ♂ ♀.

Hab. Kiukiang (*Pratt*).

Head entirely bright chestnut-yellow, only the tips of the mandibles pitchy, antennæ yellow. Thorax square, that of the male a little narrower in front than at the base, entirely yellow. Scutellum, body, and legs yellow, with the exception of the tips of the femora, the tibiæ and tarsi of the anterior and intermediate pairs, and the tips of the tibiæ and tarsi of the posterior legs, which are black. Elytra bright azure-blue, finely rugulose, but shining throughout.

Many examples of this, which is one of the most beautiful of the Telephoridæ, were captured by Mr. A. E. Pratt at Kiukiang.

23. Telephorus violaceipennis, sp. nov.

Badius; femorum apicibus, tibiis tarsisque nigris; elytris violaceis, nitidis; antennis fuscis, articulis duobus basi rufis.

Long. 20 millim. ♀.

Hab. Kiukiang.

Larger than *T. cœlestis*, and differing from it by the hind tibiæ being entirely black and by the fuscous antennæ. The elytra are of a deep violet; and the whole insect is wider and more robustly built than *T. cœlestis*, though, as there is only one female example among the many Telephoridæ collected by Mr. Pratt, it is not possible to give comparative characters. The elytra are rugulose, and almost punctured externally near the shoulders, internally and towards the apex they are obsoletely rugose, but shining.

24. Telephorus (Ancistronycha) prattianus, sp. nov. (Plate X. fig. 3.)

Niger; capite, prothorace, scutello, femorum (maris posterioribus exceptis) et antennarum articulo primo rufis, hoc nigro-maculato.

Long. 12–13 millim. ♂ ♀.

Mas. *Abdomine nigro, femoribus posticis concoloribus.*

Fem. *Abdomine nigro, femoribus omnibus basi rufis.*

Hab. China, Kiukiang (*Pratt*).

Head and thorax orange-red, shining; the former excavate between the eyes, the tips of the mandibles pitchy; eyes small but prominent; antennæ long, their basal joint yellow, spotted with fuscous above, the following joints fuscous, the third shorter than the fourth and succeeding joints, the apices of the fourth to the eighth joints slightly produced at the tips internally. The thorax squarish with rounded front angles, channelled in the middle, and strongly tumid on each side. Scutellum and bases of the four anterior femora with their trochanters and coxæ yellow, as is also the mesosternum. The elytra are dull black, granularly rugose and with one or two distinct nervures. The female has the body beneath yellow, the anterior claws being also hamate, with a tuft of setæ from the hook at their base.

25. Telephorus (Ancistronycha) orientalis, sp. nov.

Luride ochraceus; antennis (articulis duobus primis exceptis) infuscatis; prothorace oblongo-subquadrato, disco inæquali, nitido, postice longitudinaliter impresso; elytris opacis, subrugosis.

Long. 14–16 millim. ♀.

Hab. Fuchau (*G. Lewis*; *S. Leech*); Kiukiang (*Pratt*).

This is a narrow species, with the legs rather long; it is entirely ochraceous yellow, with the exception of the antennæ (of which the third to the apical joints are fuscous, but have nevertheless their bases yellow), and the fourth bilobed joint of the tarsi, which is also fuscous. The head is smooth and shining, under a

strong lens it is very closely and very finely punctured. The thorax is longer than wide, very shining; the disk is finely but deeply channelled behind, the channel ending in a wide undefined depression. The elytra are rough, each with two nervures rather distinct, their bases (as usual in this section) a little shining.

Specimens of this insect were given me many years ago by Mr. Lewis, by whom they were captured at Fuchau; it reminds one of the European *T. lividus*.

26. Telephorus (Ancistronycha) bartoni, sp. nov.

Sordide ochraceus, parum nitidus; capitis puncto, prothoracis disco utrinque, macula lineari obliqua, antennis, palpis, femoribus externe, tibiis tarsisque nigris.

Long. 15–16 millim. ♀.

Hab. North China (*coll. Gorham*), Kiukiang (*Pratt*).

This is a more robustly built and wider species than *T. orientalis*. The head and thorax are more pubescent and rougher, though distinct punctures hardly exist, except on the clypeus. The thorax is fully as wide as long (in large females perhaps a little wider), the middle of the disk with a short but deep channel, on each side of which it is widely tumid, the tumid part obliquely marked with bluish black, the mark reaching close to the reflexed margin. Scutellum yellow, but surrounded when exposed by darker markings; elytra ochraceous, dull and more granulosely rough near their apices. Legs robust and pubescent, black, but the underside of the femora, the coxæ and trochanters, and occasionally the tips of the tibiæ are yellow. The abdomen is of a more sordid ochraceous colour with the dorsal surface black, but the apical ventral segment is clearer yellow. The antennæ are black, with the underside of the two basal joints yellow.

Two or three specimens of this insect were sent me by Mr. S. Barton and are labelled "N. China;" about a dozen examples were collected by Mr. A. E. Pratt at Kiukiang.

27. Telephorus sinensis, sp. nov.

Plumbeo-niger; capitis fronte, prothorace (margine antica late et macula discoidali haud bene discreta exceptis), femoribus basi, coxis, trochanteribus et corpore subtus flavis.

Long. 15 millim. ♂ ♀.

Hab. Fuchau (*G. Lewis*).

Head fuscous black, with the front and gular parts yellow, tips of the mandible and palpi black; antennæ black, only the basal joint yellowish at its base, almost as long as the body in both sexes; eyes very prominent, almost as in *Podabrus*. Thorax nearly square, in the male a very little longer than wide, margins very little reflexed; the disk rather strongly tumid on each side of the central channel, slightly pubescent; yellow, with the front margin rounded and a little raised, black, this colour following the form of the inserted head, and with a very undefined central spot. Elytra dull fuscous black, opaque. Legs fuscous black, the base of the thighs, coxæ,

trochanters, and body yellow, some of the ventral segments faintly clouded in the middle.

Six specimens captured by Mr. Lewis are in my own collection.

28. TELEPHORUS KIUKIANGANUS, sp. nov.

Plumbeo-niger; prothorace pedibusque rufis, his tibiarum basibus tarsisque nigro-piceis, illo disco, antennis articulis duobus basalibus, abdominisque apice rufescentibus.

Long. 12 millim. ♂.

Mas? *Abdominis segmento septimo ventrali late diviso, utrinque profunde fossulato.*

Hab. China, Kiukiang (*A. E. Pratt*).

Var. *thorace toto rufo.*

The head in this insect is much narrowed behind as in *T. sinensis*, long but shorter than in that species, and with the basal and sometimes the second joints rufous. The thorax is orbicular, but longer than wide in some specimens, while equally wide and long in the variety and in other specimens. The scutellum is fuscous (but yellow in the variety); the elytra are smoky black with a blue tint, opaque but very finely sculptured, and pubescent. The greater part of the head is narrowly yellow; the breast and abdomen are ashy black, but all the segments are margined, and the curiously formed subapical segment is reddish yellow.

29. TELEPHORUS PURPUREIPENNIS, sp. nov. (Plate X. fig. 4.)

Niger, subnitidus; pronoto suborbiculari, limbo toto angustius reflexo, picescente; elytris purpureis, pube brevi concolore dense vestitis; antennis corpore paulo brevioribus, simplicibus.

Long. 14 millim.

Hab. China, Kiukiang (*A. E. Pratt*).

The head is rather small, even with the eyes (which are prominent), not being so wide as the thorax; the mandibles pitchy; the cheeks in front of the antennæ with a pale spot. The thorax black, with the margins neatly raised and paler, the reflexed edge being even testaceous beneath. The form is orbicular but generally longer than wide, and with the base rather straight, its disk smooth and shining and tumid on each side of the middle, leaving a roughly formed channel; only the very finest pubescence can be observed under the strongest lens, and that only towards the sides. Elytra rich dark purple-red, obsoletely costate.

The thorax in this species is formed as in *T. kiukianganus*, and will prevent its being confounded with species of *Lycocerus*, which in colour and the clothing and the costation of the elytra it approaches.

Three specimens. The last ventral segment has a broad and triangular impression, but the sex is uncertain.

30. TELEPHORUS METALLESCENS, sp. nov.

Flavus; capite supra (fronte excepto) prothoracisque macula parva discoidali nigris, elytris plumbeis vel subviridibus; antennis

articulis duobus primis prætermissis, pectore et abdominis segmentis quinque ventralibus in medio fuscis.

Long. 12–13 millim. ♂ ♀.

Hab. China, Kiukiang (*Pratt*).

The head in this species is broad and not much narrowed behind, the eyes are prominent, the front and gular part are yellow, the basal half and cheeks black. There is a deep fossa between the antennæ, the latter are fuscous but yellowish beneath, and two joints at the base are entirely yellow. Thorax small, square, with an irregular impression in the centre of the disk. Scutellum blackish or fuscous, becoming yellowish at its apex. Elytra bronzy green or leaden, rather shining, subrugose. Legs yellow. Breast fuscous. Abdomen fuscous on the dorsal side, margined with the yellow colour of the underside, of which only the middle of each of the first five segments has an infuscate cloud.

Several specimens of each sex.

31. Telephorus? flavicornis, sp. nov.

Flavus; capite et genis nigris, pectore abdomineque fuscis, elytris subviolaceis.

Long. 9 millim.

Hab. Fuchau, China.

Front and gular part of the head, antennæ, and palpi clear luteous yellow; the antennæ three fourths of the length of the body, the basal joints from the second to the eighth compressed, and from the fourth to the eighth having their (inner?) edge a little produced at the apex, the eighth itself having this part produced so as to form a small spur, the three terminal joints simple; all the joints, except the very short second, elongate. Head wide across the eyes, much narrowed behind, punctured obsoletely and uneven, the basal part black. Thorax yellow, once and a half as long as wide, uneven, the sides deflexed. Elytra dark violaceous, nearly black. Legs yellow, tarsi long, faintly fuscous at the tips; claw-joint thin and long, claws simple.

A single specimen of this curious insect taken by Mr. G. Lewis at Fuchau, and given to me.

Lycocerus, genus novum.

Corpus Lyciforme, *supra breviter pubescens. Antennæ ultra articulum secundum compressæ, serratæ, articulis sexto ad undecimum sensim attenuatis. Palpi sicut in* Telephoro. *Prothorax lateribus haud marginatis vel reflexis. Elytra mollia, obsolete costata, squamose pubescentia. Ungues simplices.*

This new genus is very difficult to characterize. The insects for which I propose the name are true Telephorids, but have very much the appearance of *Lycidæ*, especially of the genus *Calochromus*. The head is exserted, but yet seems in close connection with the thorax. The latter is very different to that of any Telephorid known to me, the sides not being margined or expanded, narrowed from the base (in all the three species known to me), and clothed with a fine

adpressed pubescence, which is thickest at the hind angles, these latter are acute but not projecting. The body beneath does not, so far as I can at present ascertain, present any difference from that of other Telephoridæ, and is very simple, and I cannot at present find any indication of the sexual distinction. The *Lycoceri* are plain, if, indeed, they may not be termed ugly insects, of a pale brick-red or smoky-black colour, without any brilliancy or pattern to relieve them, and their integuments are so soft that all the examples I have yet seen are shrivelled and distorted.

32. LYCOCERUS SERRICORNIS, sp. nov. (Plate X. fig. 10.)

Niger; corpore nitido, supra subsquamoso-pubescens; capitis vertice, prothorace (vitta mediana parum distincta prætermissa) elytrisque rufis; antennis serratis.

Long. 15–17 millim.

Hab. N.E. India (*coll. Gorham*); Assam, Sibsaugor (*Mus. Calcutta*); Burroi Dunseri valley (*Major Godwin-Austen*).

Crown of the head ochraceous, clothed with golden hair. Antennæ with the basal joint stout, pear-shaped, the thickest end towards the second joint, which is short and obconic, the third to the sixth joints a little longer than wide, the fourth and fifth being the widest, the three terminal joints quite narrow, the apical one almost linear, lancet-shaped. Thorax with a short and very obsolete central channel, clothed with golden squamose pubescence, without trace of punctuation, the base rather wider than the length. Scutellum smoky black. Elytra dull, sordid brick-red; humeral callosity well pronounced; there are four or five obsolete costæ or raised nervures; the surface is roughened, but neither punctures nor cells, nor indeed rugosities are present, but a close squamose pubescence of the colour of the elytra. The body and legs are entirely deep black, the breast shining and impunctate, the abdomen dull.

33. LYCOCERUS LATERITIUS, sp. nov.

Niger, parum nitidus; prothorace elytrisque saturate ochraceis; capitis vertice obscure rufo, antennis valde serratis.

Long. 13–14 millim.

Hab. India.

Smaller than *L. serricornis*, and with the antennæ wider and more distinctly serrate. The head is darker, being only obscurely red behind the eyes above. It is otherwise similarly pubescent. The thorax has no dark vitta.

Two examples in my own collection.

34. LYCOCERUS DECIPIENS, sp. nov.

Niger, parum nitidus, supra parcius pilosus; capite (epistomate excepto) prothoraceque rufis, nigro-lineatis, elytris saturate ochraceis; antennis filiformibus.

Long. 12 millim.

Hab. N.E. India, Dibru.

The head is red, excepting the front, before the antennæ, and a

distinct linear black spot upon the crown; the eyes are prominent and are wider than the thorax. The thorax has the sides nearly parallel, the middle with a narrow deep channel, which is black; each side of the disk is widely and obliquely impressed, but the front is not depressed as in the two preceding species. The antennæ are long, being three quarters of the length of the body, and pubescent, with long pilose hairs. The two basal joints are blacker than the rest, but none of the joints are smooth. The scutellum is pitchy black, red at the sides. The elytra red, with squamose pubescence and longer hairs than in the preceding species.

Two examples from Dibru, and one from the Naga Hills.

The specimens are apparently males, but I do not think they can be referred to the species with serrate antennæ.

Obs. There is a *Calochromus* from Dibru almost exactly resembling this species in colour and form.

35. Lycocerus caliginosus, sp. nov. (Plate X. fig. 11.)

Niger, subnitidus; prothoracis lateribus supra, humeris, elytrorumque marginibus postice obscure rufis, genis et mandibulis flavis; elytris opacis, fumeo-caliginosis.

Long. 12 millim.

Hab. India (*Mus. Calcutta*).

Head smoky black, rather shining, the cheeks at the base of the mandibles and the latter yellow; the antennæ flattened and widened in the middle, but hardly serrate, two joints at the base shining, the rest smoky black. Thorax with the sides narrowed from the base; the disk as in *L. serricornis*, but rather even, not much depressed in front, the middle very obsoletely channelled, the black vitta very distinct and undulate, the side deep blood-red. Elytra smoky black, the lateral margin (excepting at the base) and the apex reddish, but this colour here is ill defined, the callus is also red. Underside black and a little shining.

A very obscure-looking insect, of which nine examples in the Calcutta Museum are all I have seen. In some of these the red margin of the elytra is complete.

36. Lycocerus militaris, sp. nov. (Plate X. fig. 12.)

Niger; corpore parum nitido, prothoracis disco inæquali, obscure picescente, elytris rufo-brunneis, antennis serratis.

Long. 10–12 millim. ♂ ♀.

Mas. *Antennis longioribus, minus ampliatis, unguiculis simplicibus.*

Fem. *Antennis minus longis, articulis brevioribus latioribus; unguiculis anterioribus quatuor primis basi hamatis.*

Hab. China, Fuchau (*G. Lewis*).

Eyes prominent, head black with the exception of the cheeks in front of the antennæ, where there is a pale spot, crown a little shining, clothed with a pale golden pubescence. Antennæ (of the male) about three quarters of the length of the body, the fourth to the end joints equal in length, serrate, the fourth to the eighth widest, those of the female wider and shorter. Thorax greyish

black, the sides a little contracted in front; the disk deeply sulcate, tumid behind the middle on each side; the front margin and sides a little reflexed and often pitchy. Elytra distinctly costate, the humeral callus distinct and giving rise to one costa, between which and the suture are three costæ, that which is next the callus being prolonged to near the apex. Their colour is a dull reddish brown, which is no doubt brighter in life, and is restored by wetting them. The body beneath is dull black, clothed with short greyish pubescence. The apical segment of the male appears only to differ from that of the female in being narrow, but cannot be well observed in dry specimens.

This species has been known to me since 1863, when Mr. G. Lewis collected five specimens at Fuchau. The toothing of the claws of the female suggests affinity with *Ancistronycha*. I cannot at present, for want of more and sufficiently fresh specimens, determine whether the same structure is found in *L. serricornis* and other species. If it should prove to be so, it would not warrant the placing of such abnormal insects in that genus.

37. TELEPHORUS? sp. nov.

A single example of a *Telephorus* from Fuchau, collected by Mr. Leech.

38. HOMALISUS? sp. nov.?

A single example from Kiukiang (*Pratt*) possibly belongs to this genus: this insect has a strongly fossulate thorax, and costate and deeply punctured elytra.

39. SILIS, sp. nov.?

Hab. Fuchau (*Leech*).

Two examples of a small *Silis* (6 millim.) with black body and elytra and red thorax, the sides of which are doubly and deeply incised, and its disk deeply fossulate. Not in sufficiently good condition for study, the antennæ being lost, &c.

EXPLANATION OF PLATE X.

Fig. 1. *Telephorus khasianus*, p. 97.
2. —— *chalybeipennis*, p. 96.
3. —— *prattianus*, p. 105.
4. —— *purpureipennis*, p. 107.
5. —— *bieti*, p. 101.
6. —— *insularis*, p. 101.
7. —— *cœlestis*, p. 104.
8. —— *imperialis*, p. 102.
9. —— *nobilis*, p. 103.
10. *Lycocerus serricornis*, p. 109.
11. —— *caliginosus*, p. 110.
12. —— *militaris*, p. 110.

3. Descriptions of Land-Shells from the Island of Koror, Pelew Group. By Col. R. H. Beddome.

[Received February 19, 1889.]

(Plates XI. & XII.)

The following interesting shells were collected for Dr. Hungerford by Mr. Gibbon, who resides in Koror, or Coror, one of the Pelew Islands.

1. Diplommatina lutea, sp. nov. (Plate XI. figs. 1, 1 *a*.)

Shell sinistral, broad ovate, not rimate, thick, yellowish, irregularly blotched with black towards the apex: whorls 6½–7, gradually increasing downwards, the penultimate being the largest; sculpture a fine, close, regular oblique striation across all the whorls, last whorl ascending much on to the penultimate; a slight constriction on the penultimate, just above the columellar margin: peristome very thick, ⅓ breadth of shell, dilated at its outer margin; inner lip much expanded, shining, continuous round the apex of the aperture, where it is faintly striated across: aperture vertical, subquadrate, furnished with a tooth-like process on the columellar margin, which is lamella-like, running back into the shell. Length 3½ millim.

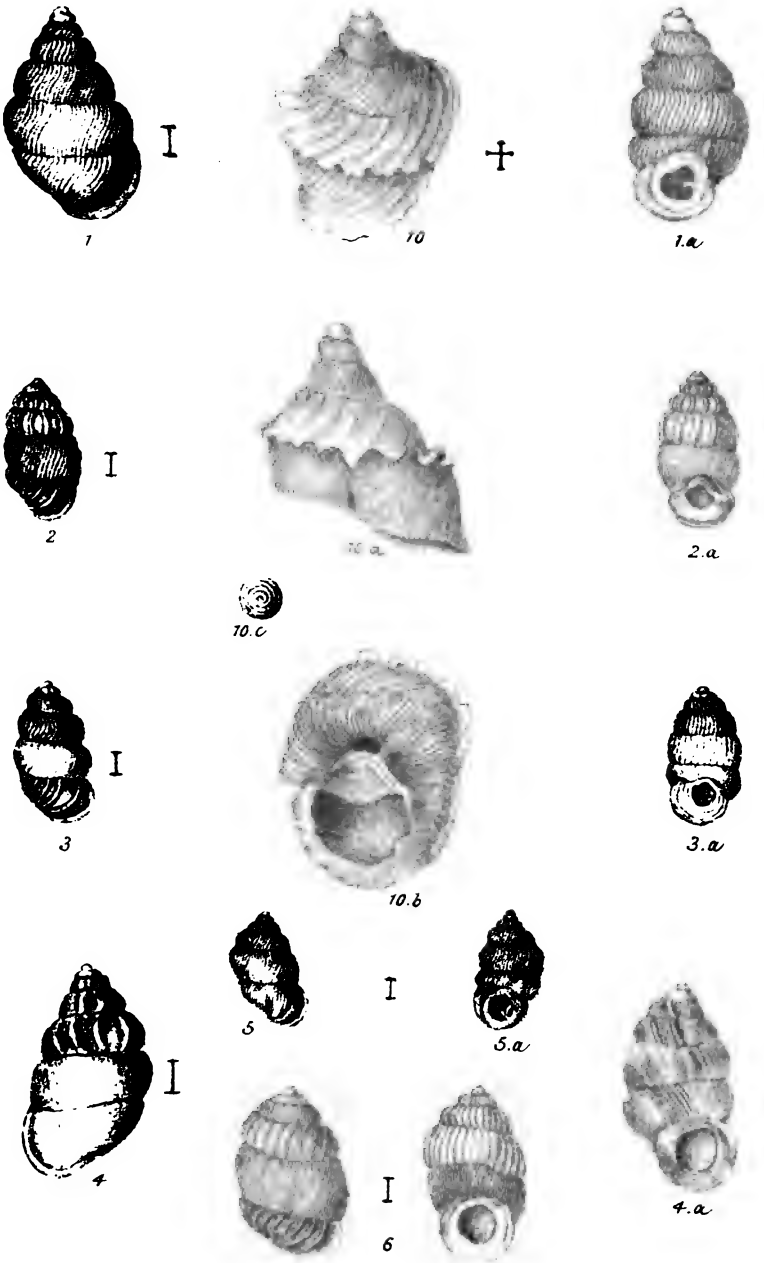
Hab. Koror.

The peristome of this and the five following species is of very great thickness in comparison with the size of the shell, much more so than in any Indian species with which I am acquainted; it might be misguiding to describe the peristome as double in these species when the outer margin is dilated, and single when there is no dilatation, as this dilatation certainly varies in different individuals of the same species and may be altogether absent, or more or less prominent in the same species.

I do not see how the subgenus *Palaina* can be kept up for these Pacific species of *Diplommatina*, as they differ more amongst themselves than many of them do from Himalayan forms, and the same may be said of *Diancta* and *Paxillus*.

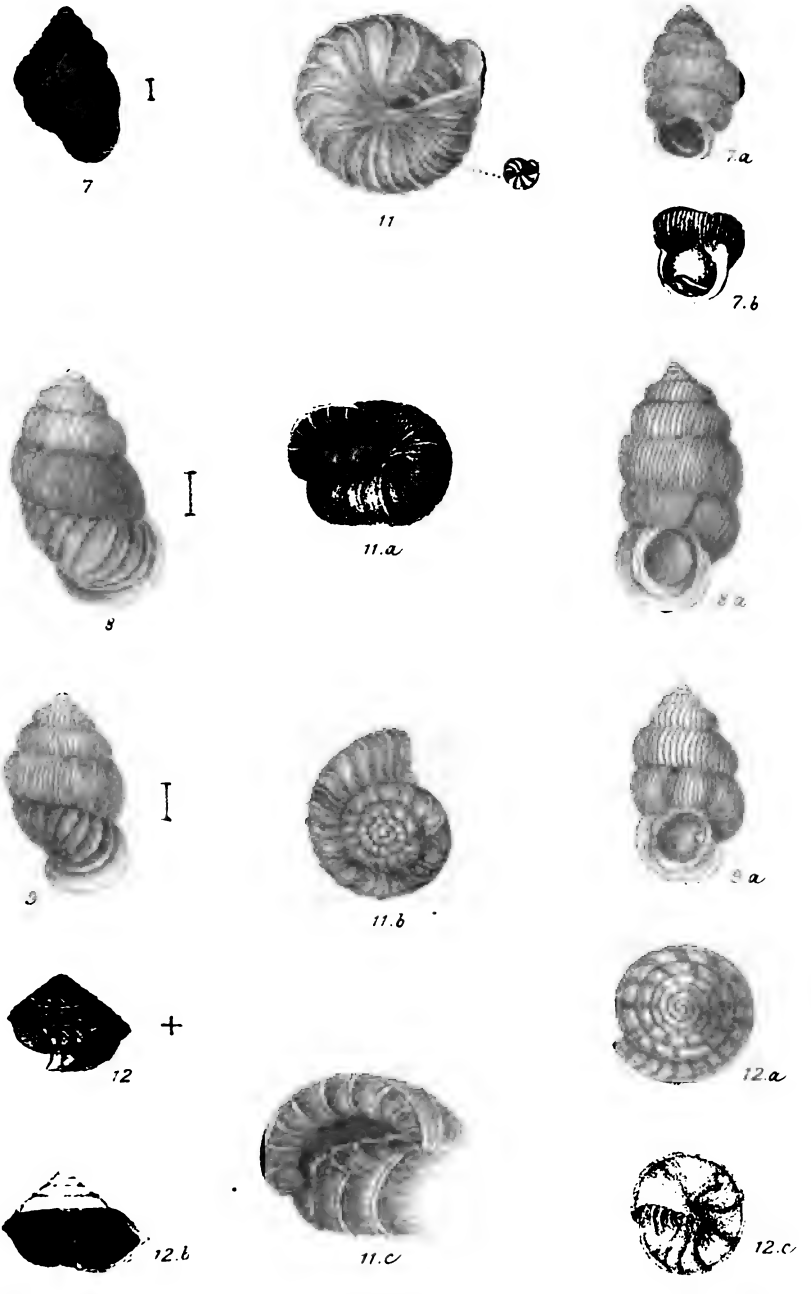
2. Diplommatina platycheilus, sp. nov. (Plate XI. figs. 2, 2 *a*.)

Shell sinistral, ovate, fusiform, thick, inconspicuously rimate, dull brick-coloured: whorls 6½–7: sculpture, the upper 1½–2 minute whorls glabrous or very finely striated, the 3rd and 4th with prominent coarse, rather thick ribs, the antepenultimate partly furnished with similar ribbing, and partly with a close fine striation, penultimate finely striated, the last whorl furnished with a few swollen convex ribs; penultimate much the largest and most swollen, with a slight constriction above the columellar margin; last whorl not ascending much on to the penultimate: peristome very thick, about ⅓ breadth of shell, finely costulate outside, the inner lip continuous: aperture much broader than high, transversely auriculate, narrowing inwards



G. B. Sowerby del. Hanhart imp.

NEW LAND SHELLS FROM KOROR.



NEW LAND SHELLS FROM KOROR.

to a circular opening from the contraction of the inner shining portion of the peristome; no trace of tooth. Length 3 millim.

Hab. Koror.

3. DIPLOMMATINA RUBELLA, sp. nov. (Plate XI. figs. 3, 3 *a*.)

Shell sinistral, oblong, conical, thick, inconspicuously rimate, reddish or reddish white in colour: whorls 6½–7; sculpture a fine close striation obliquely across the upper whorls, disappearing or very faint on the penultimate, coarse and distant on the last whorl, penultimate the largest and most swollen, last whorl not ascending much on to the penultimate, with a slight constriction just above the columellar margin: peristome very thick, about ¼ breadth of shell, the outer margin slightly or not at all dilated, striated between the margins, the inner portion continuous: aperture circular; no tooth. Length 3 millim.

Hab. Koror.

4. DIPLOMMATINA AUREA, sp. nov. (Plate XI. figs. 4, 4 *a*.)

Shell dextral, ovate, fusiform, thick, of a yellowish colour, blotched with black upwards: whorls 7½; texture smooth, except a few (3 or 4) coarse ribs across the 3rd and 4th whorls, and some faint striation on the penultimate, chiefly just above the aperture; penultimate whorl the largest, constriction very faint; last whorl not ascending much on to the penultimate: peristome much thickened, about ¼ breadth of shell, not dilated at its outer margin, striated between the margins; inner portion of lip continuous: aperture circular; a small inconspicuous swelling on the columellar margin where a tooth is present in other species. Length 4 millim.

Hab. Koror.

5. DIPLOMMATINA CRASSILABRIS, sp. nov. (Plate XI. figs. 5, 5 *a*.)

Shell sinistral, tumidly fusiform, not rimate, thick, pale yellowish, blotched with black: whorls 6½, the antepenultimate the largest; sculpture a fine close, regular, oblique striation across all the whorls, a fold generally present on the last whorl at a little distance from the peristome; last whorl not ascending much on to the penultimate; a rather prominent constriction present on the penultimate above the columellar margin: peristome very thick, more than ⅓ breadth of shell, not dilated at its outer margin, the shining inner portion not much expanded, continuous round the apex of the aperture in only a very thin layer across which the striation of the penultimate whorl is continued: aperture vertical, oblong; a small tooth on the columellar margin, below this a semilunate ridge is present, which runs back into the shell but not quite to the opposite margin. Length 2½ millim.

Hab. Koror.

6. DIPLOMMATINA ALBATA, sp. nov. (Plate XI. figs. 6.)

Shell sinistral, oblong, not rimate, thin and transparent white, shining: whorls 6½, the antepenultimate and penultimate much

swollen, the latter much the largest; sculpture on the antepenultimate a distant but rather fine costulation, on the whorl above much closer, on the penultimate very fine, close, and inconspicuous, on the last whorl rather distant but fine; last whorl not ascending much on to the penultimate; a constriction on the penultimate above the columellar margin: peristome very thick, about ⅓ breadth of shell, not dilated at its outer margin; inner portion of lip not expanded, shining, yellowish, continuous round apex of aperture, where it is striated: aperture vertical, circular; no tooth. Length 3 millim.

Hab. Koror.

7. DIPLOMMATINA GIBBONI, sp. nov. (Plate XII. figs. 7, 7 *a*, 7 *b*.)

Shell sinistral, gibboso-ovate, not rimate, white or pale yellowish, with a few dark blotches, rather thin, semitransparent: whorls 7, penultimate very much the largest and most swollen; sculpture a fine, close, regular, oblique striation across all the whorls; last whorl not ascending much on to the penultimate, furnished with an inconspicuous blunt fold a little behind the peristome, a slight constriction on the penultimate whorl, above the columellar margin: peristome thin, single, not continuous round the apex of aperture (the striations of the penultimate whorl running right into the orifice), dilated inside only at the columellar margin, where it is furnished with a small papilla-like tooth, below which there is a lunate lamella-like process running back into the shell to the opposite wall beyond the peristome; aperture subauriculate. Length 2½ millim.

Hab. Koror.

8. DIPLOMMATINA PATULA, Semper. (Plate XII. figs. 8, 8 *a*.)

Shell sinistral, oblong, conical, slightly rimate, moderately thick, reddish brown: whorls 6½–7; sculpture on the upper whorls a fine close, oblique striation, rather finer on the penultimate, particularly on the side above the aperture; on the last whorl coarse, distant, and lamella-like, except just behind the outer peristome, where it is finer and close; last whorl not ascending much on to the penultimate; the constriction on the penultimate indistinct, over centre of aperture: peristome moderately thick, not ⅛ breadth of shell, gradually dilated outwards, the outer margin prominently winged, the interspace finely costulate; the inner lip continuous and faintly striated above the aperture: aperture subcircular, no tooth; within shining orange-coloured. Length 5½ millim.

Hab. Koror.

I at first thought this species undescribed, the lamella-like costulations of the last whorl are so unlike those in the figure of *Palaina patula* in M. Crosse's Journal, xiv. p. 349, pl. x. fig. 3 (1866); there, however, being a general resemblance in size, shape, and colour, I suspected some mistake of the artist of Semper's species, so I sent a specimen to M. Crosse, who has kindly compared it with his type specimen and identified it, the artist having incorrectly represented the last whorl in his plate. The species appears to be common in Koror, as many examples were collected; in some specimens the continuation of the

inner lip of the peristome round the apex of the aperture is only represented by a very thin film, so much so that except under a powerful lens the peristome appears to be interrupted.

9. Diplommatina strigata, var. kororensis. (Plate XII. figs. 9, 9 *a*.)

Shell sinistral, ovate, conical, slightly rimate, moderately thick, bright brown-coloured: whorls 6½, the penultimate much the largest; sculpture on all the whorls, except the last, a fine, close, oblique striation, on the last whorl coarse, distant, and lamella-like, the last whorl not ascending at all on the penultimate; the constriction on the penultimate indistinct over the right centre of the aperture: peristome double, only moderately thick, the inner lip continuous, striated on the portion above the aperture, the outer lip distinctly winged: aperture vertical, circular, within shining and orange-coloured; a small rounded swelling near the base of the columellar margin is generally (but not always) present. Length 4½ millim.

Hab. Koror.

This, M. Crosse informs me, differs from the type in being a rather thicker shell, the penultimate whorl being more swollen, the aperture larger, and the lamella-like costulation of the last whorl more regular and prominent; the artist who drew the type has, M. Crosse writes, failed to render the costulations of the last whorl correctly, otherwise the figure fairly represents my specimens.

Hungerfordia (new genus).

This genus differs from *Diplommatina* in its trochiform shape, fewer whorls, which are not convex, in the great dilatation of the last whorl, and in the constriction and operculum being in the last whorl only half a turn from the aperture. Only one species has been found (many examples), so that I do not give a generic character apart from that of the species; other species will probably be discovered in this group of islands (as yet little explored), which will either establish it as a good genus, which it appears to be, or connect it with *Diplommatina* only as a subgenus.

10. Hungerfordia pelewensis, sp. nov. (Plate XI. figs. 10, 10*a*, 10 *b*, 10 *c*.)

Shell sinistral, trochiform, very thin, yellowish green: whorls 5½, not convex, except the last, which is slightly so; penultimate much the broadest, formed of about 13 oblique, slightly imbricated plaits, which terminate in small wing-like convex processes extending beyond the margin; the apical 1½ whorls very small, smooth; third and fourth whorls with a fine, very oblique striation, the suture of the fourth being slightly winged; last whorl very thin, expanded, and wing-like, not ascending at all on the penultimate, furnished with fine oblique striations, a slight constriction about half a turn from the aperture; umbilicus generally prominent, sometimes hidden

by the peristome; aperture very oblique, an oblong tooth-like process more or less developed near the base of the columellar margin, which runs parallel with the inner portion of the peristome: peristome thin, single, completely overlapped by the dilatation of the last whorl, or sometimes the edge of the whorl forms its outer margin: operculum thin, horny, concave on the outside, with about six whorls from a minute central nucleus only drawn up, the last whorl about half a turn from the mouth. Length 4 millim.; height 3 millim.

Hab. Koror.

I am indebted to Dr. Hungerford for a very perfect specimen of *Arinia scalatella* collected in Zebu. The operculum, which is quite similar to that of *Diplommatina*, is situated only a short distance from the aperture, being clearly visible looking up the orifice; there is no sign of a constriction. *Arinia* appears to me to be a good genus, at any rate it cannot be placed in the *Nicida* section of *Diplommatina* with the South-Indian and Ceylonese species; the transverse striations, never present in *Nicida*, are prominent on the upper whorls, and the position of the operculum seems to be a marked distinction.

11. Helix (Endodonta) kororensis. (Plate XII. figs. 11, 11 *a*, 11 *b*, 11 *c*.)

Shell very narrowly umbilicate, thin, somewhat discoid; spire depressed; colour light brown, blotched with a darker shade, transversely decussated with about 23 revolving, prominent, thin, wavy ribs, otherwise smooth: whorls 5, convex; peristome thin; aperture lunar-circular, furnished with 4 narrow lamellæ on the parietal wall and 9 on the opposite exterior wall, all of which run into the shell parallel with the whorl about 4 millim. Diameter of shell 5½–6 millim.; height 4 millim.

Hab. Koror.

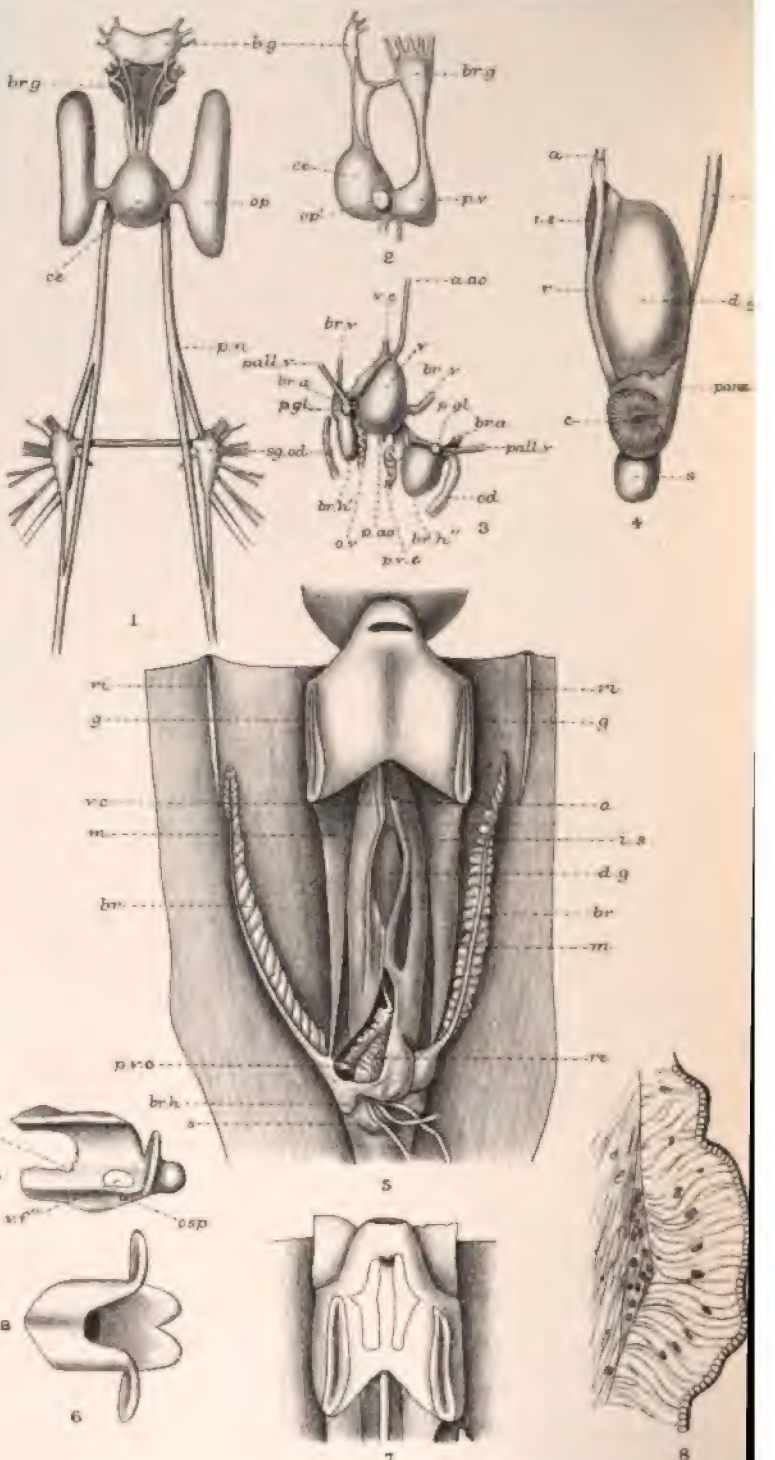
A very beautiful species.

12. Helix (Endodonta) fusco-zonata. (Plate XII. figs. 12, 12 *a*, 12 *b*, 12 *c*.)

Shell convex, depressed, thin, pale yellowish brown, transversely banded with fuscous bars; spire scarcely raised, obtuse: whorls 6, furnished with rather prominent, close, transverse, oblique striations, the sutures convex and considerably raised; the last whorl rather sharply angled at the periphery: umbilicus small but distinct; aperture lunate: peristome simple, thin; three elongated lamellæ on the parietal wall, which run some way into the shell, two prominent but rather shorter ones opposite on the outer wall, near the umbilicus and one or two subobsolete ones just beyond these. Length of shell 3½ millim.; height 2½ millim.

Hab. Koror.

Nearest to *H. constricta* (Semper), but differs considerably in its prominent striation, sharply angled periphery, and raised sutures.



Parker & Coward lith.

West, Newman

Anatomy of Conatus fabricii

Parker & Coward lith.

West, Newman & Co. imp.

Anatomy of Gonatus fabricii

EXPLANATION OF THE PLATES.

Plate XI.

Fig. 1, 1 *a*. *Diplommatina lutea*, p. 112.
2, 2 *a*. —— *platycheilus*, p. 112.
3, 3 *a*. —— *rubella*, p. 113.
4, 4 *a*. —— *aurea*, p. 113.
5, 5 *a*. —— *crassilabris*, p. 113.
6. —— *albata*, p. 113.
10, 10 *a*, 10 *b*, 10 *c*. *Hungerfordia pelewensis*, p. 115.

Plate XII.

Fig. 7, 7 *a*, 7 *b*. *Diplommatina gibboni*, p. 114.
8, 8 *a*. —— *patula*, p. 114.
9, 9 *a*. —— *strigata*, var. *kororensis*, p. 115.
11, 11 *a*, 11 *b*, 11 *c*. *Helix* (*Endodonta*) *kororensis*, p. 116.
12, 12 *a*, 12 *b*, 12 *c*. —— (——) *fusco-zonata*, p. 116.

4. Observations on the Anatomy of a rare Cephalopod (*Gonatus fabricii*). By William E. Hoyle, M.A. (Oxon.), F.R.S.E. (Communicated by Professor G. B. Howes, F.L.S., F.Z.S.)

[Received February 27, 1889.]

(Plates XIII. & XIV.)

Contents.

I. Introduction, p. 117.
II. General Disposition of the Organs, p. 119.
III. The Cartilages, p. 119.
IV. The Pen, p. 121.
V. The Muscles, p. 124.
VI. The Nervous System and Senso-Organs, p. 124.
VII. Digestive Organs, p. 125.
VIII. Circulatory Organs, p. 126.
IX. Respiratory Organs, p. 127.
X. Excretory and Generative Organs, p. 127.
XI. The Funnel-Organ, p. 128.
XII. General Conclusions, p. 131.
XIII. Explanation of the Plates, p. 134.

I. *Introduction.*

The specimens upon which the following investigation is based were as follows:—

1. Three immature examples obtained during the 'Valorous' Expedition, varying in length from 30 to 50 millim.

2. A number of fragments, representing about a dozen individuals, taken by my friend Mr. Robert Gray, of Peterhead, from the stomachs of a Bottle-nosed Whale (*Hyperoodon rostratus*) and a Narwhal. These were for the most part only arms, from which all the hooks and suckers had been removed, with the buccal mass included

between their bases. In two cases parts of the trunk were preserved, but in no instance was there anything like a complete specimen. In consequence, I have been unable to give any account of several organs, and my descriptions of others are lamentably incomplete; but it seemed better on the whole, in view of the rarity of this species, of its unique external characters, and of our almost entire ignorance as to its anatomy, to utilize the material at hand and endeavour to throw light upon the somewhat obscure relationships of this remarkable form.

It is perhaps worth while to mention the order in which the digestive process seems to attack the various parts of the body. The cuticle very soon disappears, then the fin becomes detached, and the posterior end of the pen is dissolved, being probably of a softer consistency than the shaft. Then most of the hooks and suckers become detached, and the tentacular clubs lose the greater part of their armature. The digestive organs and genital glands disappear, and the gills become disorganized, the circulatory organs persisting longer. The head with its attached arms then separates from the body. The nervous tissues are very persistent. The last portions of the body to remain are the mandibles and the lenses of the eyes, which often occur in the stomachs of Cetacea in considerable numbers.

Regarding the external description and history of this Cephalopod I may refer to my 'Challenger' Report[1] and to the authorities therein quoted[2]. The only published information known to me regarding its internal anatomy is about half a page in Verrill's Monograph of the Cephalopods of N.E. America[3]. Its peculiarities are such that I have ventured upon the step of creating a new subfamily for its reception, and it was therefore a matter of special interest to ascertain that this procedure was justified by the internal structure.

For the convenience of the reader I may be allowed to recapitulate here the chief peculiarities of the species, as it will be necessary to refer to them in the subsequent discussion.

1. *The Arms* have each four series of suckers or hooks, whilst all the other Œgopsids have only two.

2. *The Ventral Arms* possess only suckers in all the four series, whilst the other arms have two series of suckers along the margins and two series of hooks up the centre.

3. *The Tentacles* are furnished even from a point low down upon the stem with regularly disposed longitudinal series of small suckers and corresponding fixing-cushions.

4. *The Connective Apparatus* is continued up one side of the club, where it forms a group of five or six large suckers and fixing-cushions, whilst the middle of the club itself is occupied by a very short series of two large and three very small hooks, and the tip of the club is covered with small suckers.

[1] Report on the Cephalopoda. 'Challenger,' Reports, Zool. vol. xvi. part xlvi. p. 174 (1886).

[2] Especially Steenstrup, Oversigt K. D. Vid. Selsk. Forhandl. 1881.

[3] Trans. Connect. Acad. v. p. 393 (1881); also Rep. U. S. Fish Com. for 1879, Washington, p. 418 (1882).

5. *The Gladius* is narrow and linear anteriorly, but broader and lanceolate in the hinder two thirds, whilst it ends posteriorly in a hollow cup or cone, which has several diaphragms within it, and is not covered outside and behind by a solid chitinous spine as is the case with most, perhaps all, Onychoteuthids; at all events no species hitherto known has such a hollow cone.

6. *The Fins* extend some distance beyond the hinder end of the body, and their firm saddle-shaped cartilage slides upon the terminal portion of the gladius.

7. *The Radula* has only five rows of teeth, instead of the usual seven.

II. *General Disposition of the Organs.*

The mantle-cavity is very extensive, reaching backwards almost to the end of the caudal extremity; when it is opened the following arrangement of parts may be observed (Plate XIII. fig. 5). The siphon is of the usual form, having a valve, as has already been recorded by several observers, although Gray denied its existence.

The two retractor muscles of the siphon (*depressores infundibuli*, *m*, *m*) are seen stretching backwards from its base on either side, and external to them are the gills (*br.*), which are very long and fixed to the mantle almost as far as their ends. Attached to the base of the siphon, to the lateral aspect of the head, and to the mantle in the middle line above is the usual valvular flap formed by the collaris muscle, which prevents the egress of the water from the lateral parts of the mantle-cavity.

The ink-sac (*i.s.*) lies in the middle line and extends forwards almost to the anus (*a.*): in the larger specimen it was quite fragmentary, but appeared to reach further backwards than in the small ones, in which, moreover, it was somewhat obliquely placed. The rectum passes over it forwards from right to left, and the anal flaps (in the small examples) are simple in form, and taper gradually from the base to the apex. The vena cava (*v.c.*) lies along the right side of the digestive gland ("liver" of most authors).

Through the renal sac may be seen the sacculations on the vena cava (*re.*) and the branchial hearts (*br.h.*) in their usual situation. The renal openings seem to be minute papillæ, situated just in front of the branchial hearts, as in *Onychoteuthis*. One of my specimens showed them, and I was able with some difficulty to make out their position in a specimen in the British Museum. The apertures of the oviduct (Plate XIII. fig. 3, *od.*) are deeper than and external to the branchial hearts, and the nidamental glands may be seen in the middle line immediately posterior to the renal organs: the posterior aorta passes out between their diverging hind extremities.

In the smaller specimens the stomach (*s*) could be discerned in the middle line behind the bases of the gills; the genital gland when fully developed appears to cover it.

III. *The Cartilages.*

The Cephalic Cartilage.—Two heads of larger specimens were

preserved: in one the cartilage was sacrificed to the dissection of the nervous system, and in the other it had already suffered a good deal of mutilation. I made a sketch of the fragments put together as carefully as possible, and afterwards compared this with the series of sections through the head of one of the smaller specimens. The two figures (Plate XIII. fig. 6) do not therefore represent a drawing of an actual specimen, but have been put together from these two sources.

The basal portion of the cartilage, situated below and behind the united pedal and visceral ganglia, consists of an oblong box with a longitudinal septum down its middle. Each division is produced backwards as a blunt prominence; these are the receptacles in which the auditory organs are lodged. Anteriorly the sides of this box converge and the lower portion of the cartilage comes to consist of a vertical keel, which splits at its lower margin into two plates passing outwards and downwards below the eyeballs. These plates are each perforated near their outer margin by a foramen (*osp.*), which serves to transmit the nerve to the osphradium. At the point where the sloping subocular plate joins the vertical keel is a large foramen (*v.f'.*), which serves for the passage of the veins from the eyes into the large vena cava. Another foramen in the middle line (*v.f'.*) gives passage to the veins from the central nervous system. From either side of the box a vertical plate is given off which lies upon the posterior surface of each eye. The vertical sides of the box are produced upwards and support a horseshoe-shaped plate, the concavity of which is directed backwards. The convexity extends much further forwards than the vertical supporting plates, and arches over a space in which the cerebral ganglia are situated; its anterior extremity is bluntly pointed. There are no basi-brachial cartilages such as are seen in *Sepia*, but there is a thin plate of that material in the dorsal wall of the vena cava behind the cephalic cartilage and quite disconnected from it.

The *nuchal* and *siphono-articular* cartilages (Plate XIII. fig. 7) present no special characters worthy of note. The latter are of the linear kind common to the greater number of Decapoda; they exhibit a tendency to a slight curve, in the form of *f.*

Of more interest is the presence of a pair of cartilages in the ventral wall of the siphon on its outer aspect. These are two thin plates (Plate XIII. fig. 7) of the form roughly of an isosceles obtuse-angled triangle, the median border being straight, the outer expanding to an angle. The sheet of cartilage is thickest near the middle line and thins out gradually towards the side, losing itself in the surrounding tissues. Their formation had not commenced in the smaller specimens: compare Plate XIII. fig. 5.

The *basi-pterygial* cartilages had, however, developed to a considerable extent in these examples. The extremity of the pen lies in a groove between them.

The *pallial* cartilages have a much more intimate connection with the structure of the body-wall than seems to me to have been hitherto recognized. The nuchal cartilage commences as a thin plate which lies upon the muscles in the dorsal median line. Its

upper surface is curved so as to fit into the under surface of the cartilaginous pad which lies below the pen. A little further back (Plate XIV. fig. 1) two processes are seen, one on each side, passing downwards into the muscles, which thus take their origin from them. Still further backwards these processes become longer and pass completely through the body-wall, separating the muscles, which here compose it, into quite distinct masses. The outer limb of the collaris muscle (*co''*.) springs from the notch between the horizontal plate of the cartilage and its vertical process, whilst the inner limb (*co'*.) is attached to the internal surface of the process. As this last lengthens, however, the muscular attachment shifts from the inner surface to the narrow terminal edge of the vertical process.

Three small cartilages which lie below and on either side of the pen will be considered subsequently.

IV. *The Pen.*

The larger specimens presented nothing more than fragments of the stem of the pen, but in the smaller ones transverse sections which were made through the anterior part of the mantle and two series of longitudinal sections through its posterior extremity yielded some information regarding the structure and relations of the pen and pen-sac; and therefore since, so far as I am aware, no observations upon these organs in the Decapoda have hitherto been published, I propose to devote a few words to their description. A transverse section made about a millimetre behind the margin of the mantle is figured on Plate XIV. fig. 1. The pen itself (*p*.) has the figure of an arch with everted limbs, which lies on the whole a little nearer the ventral than the dorsal surface of the mantle. In most instances the process of cutting has produced cracks in it, which indicate its composition of layers parallel to its upper and lower surfaces. It is covered on both sides by an epithelial layer. In the preparations the contraction of the tissues has drawn the lower layer away from the pen, but there can be no reasonable doubt that during life they were in apposition. The upper layer of epithelium (*e'*) consists of very small flattened cells, shortly oval in section and with nuclei of corresponding form; they contain only a small amount of protoplasm. The epithelium below the pen (*e''*), on the other hand, is immensely thicker, consisting of a single layer of elongated columnar cells. The protoplasm of these cells stains more deeply in the distal than in the proximal portion, and is very faintly granular. The nucleus is situated about one third from the proximal end of the cell, and contains a deeply stained nucleolus at its distal end.

The concavity of the arch is partially occupied by a pad of cartilage (*s.nu*.), which is thickest in the middle line and thins away, at first suddenly, then more gradually towards the extremities. The form is such that this cartilage fits exactly into the other one which is embedded in the muscles in the dorsal median line. This is not apparent in the figures because these were drawn from different sections. The two concavities which are due to the eversion of the limbs of the arch are also filled by pads of cartilage (*su.g*.) similar

in histological structure to that just mentioned. The matrix of this cartilage is perfectly hyaline and does not take up the staining-fluid (borax carmine), and there is comparatively speaking a considerable thickness of it between the adjacent cells. In the centre of the cartilage the cavities are subspherical, but towards the surfaces, particularly towards that one which is directed to the pen, they show a tendency to become flattened. The cell-contents appear pale and structureless, and are slightly retracted from the margin of the cavities in which they lie. The nucleus is variable in form and is always pushed quite to one side of the cell, usually towards that side which is directed to the pen. In the two lateral pads of cartilage it is larger, rounder, and more frequently shows traces of cell-division. The inferior surface of the median cartilage is, of course, covered by the epithelial lining of the mantle (*e.m.*), which here becomes ventral and has very distinct round nuclei.

The structure of the pen-sac undergoes various modifications in its different parts. At the anterior extremity (fig. 4), for example, its structure is much simplified. Merely the two layers of epithelium are to be found, but even here the lower one is much thicker than the upper owing to the different form of the cells. At this point no trace of the cartilaginous pads is visible. This preponderating thickness of the lower epithelium may also be observed in embryos, as is shown in several of Bobretzky's[1] beautiful figures. There can be little doubt that it indicates that this lower layer is the one which is active in secreting the pen.

A little further back than the region first described the pen undergoes a slight change in the form of its transverse section. It not only becomes thicker, but each limb of the arch gives off a prominence near its end, towards the middle line, the limb itself being prolonged outwards to a thin sharp edge. Opposite the prominence the lower epithelium is thinner than elsewhere, but it thickens out into a triangular pad between the prominence and the extremity of the limb of the arch, thus forming a kind of mould upon which the pen is shaped.

Still further back, on a level with the stellate ganglia, both layers of epithelium have the same appearance, the inferior one having become reduced to a layer of simple pavement epithelium. This point is posterior to the region of the nuchal cartilages, hence no cartilage is to be seen below the pen. The two upper cartilages have also disappeared, and the concavity of the arch is filled with connective tissue.

The posterior extremity of the pen-sac showed some points worthy of being recorded. This part of the animal was entirely digested away in the larger examples, and the observations here recorded were based upon sections of two of the smaller specimens.

At the posterior extremity of the body both the superior and inferior tracts of epithelium are extended laterally and their edges

[1] Bobretzky, "Izsliedovaniya o Razvitie Golovonogikh" [Investigations on the Development of the Cephalopoda], Izvest. Mosk. Univ. xxiv. figs. 34, 58, 62, 85, 87 (1877).

unite so that each forms a cone, the inferior layer being internal to the superior (Plate XIV. figs. 2, 3). They are not in contact, but a narrow space is left between them, which of necessity has the form of a funnel. Furthermore the internal epithelial cone is truncated, so that a conical space is left between it and the outer cone. In the preparations the epithelial surfaces had shrunk away at many points from the chitinoid material below.

The epithelium lining the pen-sac (e', e'') is, in this region, thin and composed of cubical cells, except at a point near the tip of the pen on the dorsal aspect, where the cells are almost columnar. The appearance of the shell itself does not differ from that seen in the more anterior regions except that it is paler in colour and seemingly softer in consistency, for it does not crack under the razor. A very curious tissue, however, fills up the small conical space, which was described as existing at the extreme tip of the pen-sac (*c.p.*). Immediately lining the epithelium is a layer of normal pen-substance, that is to say, not differing from that seen in the adjacent parts. Within it is the mass of tissue just mentioned (*c.p.*). It consists of a matrix which takes up borax carmine very faintly, but still just sufficiently to mark it off clearly from the chitinoid pen-substance. It presents a series of striations, which pass over it irregularly in very various directions, sometimes straight, sometimes curved. Quite at the posterior extremity an appearance is presented as though the dorsal limb of the pen had been bent sharply backwards upon itself (fig. 3). The matrix contains a large number of vacuoles, of spherical or ovoid form, their long axes, in the latter case, lying parallel with the striations above mentioned. They vary considerably in size. Within the matrix, moreover, numerous nuclei are embedded; but in only one or two instances was I able to make out any cell-substance connected with them, and in these it had a loose granular appearance. Two or three examples showed the cell-substance passing off from the nucleus in the form of radiating threads, such as have been frequently figured in representations of the cartilage of the Cephalopoda; I was, however, unable in the preparations examined to trace the processes of the cells into the matrix. Many of the nuclei could be easily seen to be lying in the vacuoles in the matrix, but many looked precisely as though they were closely surrounded by the matrix itself. This was probably erroneous, for with the highest powers which the preparations would bear the number of cells which could be distinctly seen to be surrounded by vacuities was greatly increased. The conclusion seems to be that we have here to deal with a form of cartilage, but of a degenerate type. It will be interesting to ascertain whether any material of similar nature occurs in corresponding situations in *Ommastrephes* and *Onychoteuthis*.

In the other specimen of which longitudinal sections were made (fig. 2) the appearance presented was somewhat different. The matrix had entirely lost its subhyaline as well as its striated look and was evenly granular throughout. Only a vacuole could be seen here and there, and the nuclei also had almost disappeared; so that one might suppose that here the degeneration of the cartilage had

reached a more advanced stage. Another observation, too, indicates beyond a doubt that the process of pen-formation has proceeded further in this specimen than in the other. At the base of this cone the epithelium has been retracted away from it, and on the surface thus liberated could be seen a film of highly refractive material (*sep.*). A similar film is also discernible on the ventral aspect of the base of this cone, and they both become thinner and disappear as they pass towards the centre of the base. I think it is safe to conclude that we have here the incipient formation of the phragmocone which is known to be present at the posterior extremity of the pen of *Gonatus*. The conical mass of degenerate cartilage then serves the purpose of a mould upon which the septa of the phragmocone are deposited.

Near the middle of the granular mass was a curved band of apparently denser material than the rest, in the centre of which a faint line could be traced. Whether this is merely accidental or whether it indicates the position of an earlier incomplete septum I have no means of ascertaining.

V. *The Muscles.*

Regarding the disposition of the muscles not very much is to be said; on the whole it resembles the arrangement found in *Onychoteuthis* and *Enoploteuthis*, but differs from both these in certain respects.

The capsule of the liver, formed by the retractor muscles of the head, is much less strongly developed than in *Onychoteuthis*, the lateral portions being, to all appearance, merely membranous without any muscular fibres. The *retractores capitis mediani* arise separately in their usual situation near the middle line; as they pass forward they approach each other and fuse together a short distance behind the point at which the cephalic aorta enters them; in front of this they are again easily separable. In a specimen of *Onychoteuthis banksii* which was examined for the sake of comparison there is a union in the same place, but less complete.

The *retractores capitis laterales* are slightly developed and they seem to be distinctly separated from the median retractors by a membranous interval in the capsule of the liver.

No muscle is present running from the head to the ventral surface of the pen-sac, and passing over the commissure between the two ganglia stellata, such as is described by Brock[1] in the case of *Enoploteuthis*.

The *collaris* muscle has the usual disposition and relations.

The *adductor infundibuli inferior* has pretty much the same arrangement as in *Onychoteuthis*. It arises far forwards and some distance from the ventral line, and is inserted nearly in the middle line a little distance behind the posterior infundibular nerve.

VI. *The Nervous System and Sense-Organs.*

The *central nervous system* (Plate XIII. figs. 1, 2) resembles most

[1] Brock, "Versuch einer Phylogenie der dibranchiaten Cephalopoden," Morph. Jahrb. vi. p. 198 (1880).

nearly that of *Ommastrephes*, of all those which have hitherto been described in detail [1]. The brachial ganglion (*br.g.*), however, is not quite so widely separated from the pedo-visceral (*p.v.*) as in that genus.

The fusion between the pedal and visceral ganglia is very complete. Buccal ganglia (*b.g.*) are situated upon the posterior extremity of the buccal mass, and are connected as usual both with the cerebral and brachial ganglia. Furthermore there is present a cerebro-brachial connective.

The *Peripheral nerves* could scarcely be made out at all owing to the disintegrated condition of the specimens, but it was easy to see that the brachial commissure is simple as in all Decapoda.

The *Stellate ganglia* are large flattened pyriform bodies; they are connected by a strong and easily recognized commissure. The pallial nerve (*p.n.*) divides a little distance before reaching the ganglion, the main trunk passing directly backwards and reuniting with the nerve given off from the posterior extremity of the ganglion. This arrangement resembles in its general features that figured by Brock [2] for *Ommastrephes* and *Todarodes*, but with certain minute differences.

A number of sections were made of the *Eye*, but they did not exhibit any features calling for special notice.

The *Osphradium* consists of a small antero-posteriorly directed ridge, which is placed below and a little behind each eye; it could be very clearly followed through a number of sections extending perhaps over half a millimetre of the animal's length. The preparations did not show any of the histological features characteristic of the osphradium, but I feel justified in regarding this ridge as such partly because of its position, and partly because just internal to each of these ridges there was a foramen in the cephalic cartilage through which passed a nerve.

The *Auditory Organs* occupy their usual position.

VII. *Digestive Organs.*

The *Beak* is remarkable chiefly for the long curved apex of the superior mandible. It has been figured by Steenstrup, but unfortunately the plate containing it has not yet been published.

The *Radula* has been admirably figured by Sars [3]. It is remarkable as being the only known Cephalopod radula in which only five rows of teeth are present. On comparing it with the radulæ of *Onychoteuthis* [4] and *Enoploteuthis* [5] it appears that the teeth which have disappeared are those situated close to the median tooth ("Zwischenplatten" of Troschel). The median teeth themselves have a long median denticle, and on either side a short acute denticle, so that they resemble those of *Onychoteuthis* rather than of

[1] Compare Pelseneer, "Valeur morphol. des bras, &c. . . . des Céph.," Arch. de Biol. viii. fig. A.

[2] Brock, *op. cit.* p. 226, pl. xi. fig. 7.

[3] 'Mollusca regionis arcticæ Norvegiæ,' pl. xvii. fig. 2 (1878).

[4] Troschel, "Mundtheile d. Ceph.," Arch. f. Naturg. xix. i. p. 11, pl. i. fig. 6.

[5] Brock, *op. cit.* pl. xii. fig. 10 *C*.

Enoploteuthis. The medio-lateral teeth are shorter and less acute than in either of these forms.

The *Anterior Salivary Glands* are present and lie in the form of two ramified glands packed away in the floor of the mouth. Their openings are situated one on either side of the median elevation which forms the floor of the mouth anterior to the radula.

The *Posterior Salivary Glands* are in contact with the inferior surface of the œsophagus, and slightly overlap the cephalic cartilage; they form a pyriform mass, the pointed extremity being directed backwards. The entrance of the duct into the œsophagus was not made out.

The *Œsophagus* (Plate XIII. fig. 4, *œ*) is very slightly fusiform just behind the central nervous system; but it cannot be said that a crop is formed unless the expansion were very much greater than in the examples examined. Another fusiform portion is seen just before it opens into the stomach.

The *Stomach* (*s*) is simple and saccular, more elongated in the larger specimen than in the smaller. In one of the examples from the Narwhal's stomach there was a chitinous lining, which had become completely detached. It appeared to have formed a coating over the whole inner surface of the organ, and is much thinner at the posterior extremity than it is a little way behind the œsophageal opening. There were, however, no dentiform prominences such as I hope to describe elsewhere in an account of the genus *Tuonius*. In the same instance it contained a quantity of fragments of Crustaceans, but not one of them was large enough to give any chance of specific determination.

The *Rectum* (*r*) as usual leaves the stomach close to where the œsophagus enters it, and about the same point is the opening of the cæcum. It presents no noteworthy features.

The *Cæcum* (*c*) lies upon the anterior part of the ventral aspect of the stomach, somewhat towards the right. It is coiled into a complete spiral and presents a striated appearance which seems to be due to a series of folds in its lining mucous membrane.

The *Digestive Gland* (*d.g.*, "liver" of various authors) is large and ovoid and has the usual relations. The structure usually known as "pancreas" (*pan.*) is situated in the angle between it and the cæcum and œsophagus.

VIII. *Circulatory Organs.*

The *Heart* (Plate XIII. fig. 3, *v*) is broadly pyriform in shape, the anterior end being somewhat narrower than the posterior; it is directed as usual almost antero-posteriorly, the anterior end being turned a little towards the right. At two opposite points in its largest diameter the heart receives the branchial veins (*br.v*), which as usual pass along the anterior or free side of those organs. There are only two aortic apertures to the heart, which are situated at its anterior and posterior extremities (*a.ao*, *p.ao*); the former gives off the cephalic aorta, quite in the ordinary manner. As regards the vessel from

the posterior end I regret my inability to give a satisfactory account of its distribution, and the more so since it would have been interesting to ascertain how far it agrees with what Brock [1] has indicated as the typical arrangement among the Œgopsida. All that I am able to assert is that this vessel does not branch until a distance of about 2 centim. from the heart; at which point it bifurcates. It seems probable that these two branches represent the anterior and posterior aortæ of Brock, in which case I have failed to discover the arteria genitalis; this, however, is not much to be wondered at considering the state of preservation of the specimens. There were no aortic hearts to be seen in any of these vessels.

The *Vena Cava* (*v.c.*) bifurcates on a level with the anterior part of the ventricle; a branch passing to each branchial heart, at the entrance to which it is joined by a vein passing from behind forwards over the dorsal surface of the branchial heart (*p.v.c.*). A third vein (*o.v.*), beset like the others with renal sacculi, passes over the dorsal surface of the left branchial heart and then turns downwards over the root of the left gill to join the other vessels entering the left branchial heart; it probably comes from the ovary, but it was impossible to make this out with certainty.

The right *branchial heart* (*br.h.*") is somewhat smaller and more distinctly quadrate in form than the left (*br.h.'*). Each of them bears upon its dorsal anterior margin a small flattened spheroidal pericardial gland (*p.gl.*).

IX. *Respiratory Organs.*

The *Gills* appear, on the whole, to be constructed on the same type as in *Ommastrephes* [2], as was noticed by Verrill.

X. *Excretory and Generative Organs.*

Regarding the *Renal Organs* nothing more of any importance was made out than has been noted above (p. 119).

But little can be said regarding the generative organs. The two larger specimens which I examined were both females, as was shown by the presence of the *oviducts* (Plate XIII. fig. 3, *od.*). There are two of these, which are gently curved and pass forwards just external to, and on the dorsal surface of, the root of each gill. Their extremities are pointed and the opening is a slit on one side of the tip.

Nidamental glands are present as two flattened sausage-shaped bodies, with their convexities directed towards each other, in the middle line. They present the usual lamellar structure.

Regarding the male organs Verrill makes the following statements:—"The specimen is still immature, and probably only one year old. The spermary or 'testicle' is small (length 18^{mm}, diameters 2^{mm} and 4^{mm}), flattened, tapering backward, partly

[1] *Op. cit.* p. 247.

[2] Joubin, "Struct. et dével. de la Branchie des Céph.," Arch. Zool. exp. (2) iii. 1885.

enclosed by the hooded portion of the pen, and with the anterior end attached laterally to the posterior end of the cæcal lobe of the stomach. The prostate gland, vesiculæ seminales, and spermatophore-sac are small; the efferent duct is long and slender, extending forward over and beyond the base of the left gill."

XI. *The Funnel-Organ.*

This apparatus has been the subject of one or two communications within the last few months, and hence it seemed desirable to make what contributions to the subject were possible from the material at hand. Its history may be dismissed in a few words, since Dr. Brock has recently gone into this matter somewhat fully [1]. It seems to have been first observed by Heinrich Müller [2], who observed it in a large number of species during a sojourn at Messina in 1852. He describes the macroscopic appearance and gives some account of the minute structure. It consists of a median and two lateral pads. "Their surface," he says, "is made up entirely of spindle-shaped corpuscles. . . . . They present great similarity to the nettle-organs of other animals, but are devoid of a filament . . . They are developed in the interior of cells, in which they are often twisted and coiled in various ways." No suggestion regarding their function is here propounded.

Franz Boll [3], in his classic "Vergleichende Histiologie des Molluskentypus," devotes a page to the consideration of the topic. He confirms Müller's account, and points out in addition that the fusiform corpuscles (which he figures) become surrounded by an excretory vesicle ("Secretbläschen"). He compares them with the rod-like bodies found in the epidermis of the *Turbellaria*, but makes no suggestion as to their proper function.

In 1877 Bobretzky [4], in his finely illustrated work on the development of the Cephalopoda, figured sections of the organ in the embryos of *Loligo*, and referred to it as a "thickening of the epidermis (? rudiment of the funnel-organ)."

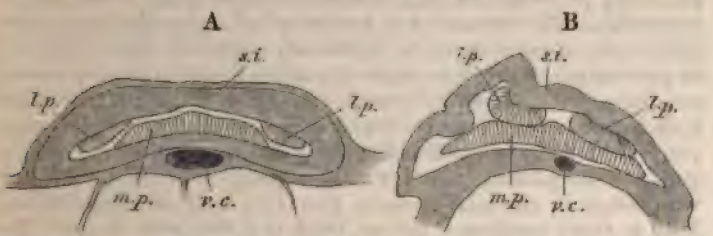
In 1881 Prof. A. E. Verrill [5] described a very highly developed form of this apparatus in the cases of *Taonius pavo* and *T. hyperboreus*. Shortly afterwards I was able to show that a similar structure is present in all the species of that genus [6], and, being at that time ignorant of the previous accounts of it, proposed to give it the name of "Verrill's Organ." In the light of our present knowledge it seems inappropriate to continue the use of this name, and perhaps the proper course to pursue would be to make use of the name funnel-organ ("Trichterorgan"), which occurs in the pages of the earliest writers upon it.

[1] Nachrichten Göttingen, No. 17. 1888, 3 pp.
[2] Zeitschr. f. wiss. Zool. iv. p. 339 (1853).
[3] Arch. mikr. Anat. v. Suppl. p. 97 (1869).
[4] *Op. cit.* figs. 52, 55, 57, 74, and especially 83.
[5] "Cephalopods of N.E. America, II.," Trans. Connect. Acad. v. pp. 413, 432, pl. lv. figs. 2*d*, 4*a*.
[6] *Loligopsis* and other genera," Proc. Roy. Phys. Soc. Edinb. viii. 1885.

The only other recent addition to the literature of the subject is a short paper by Malcolm Laurie [1], which adds little of importance to our knowledge.

A large number of the transverse sections which I made through the anterior region of one of the small specimens of *Gonatus* showed the funnel-organ. Its state of histological preservation was far from satisfactory; indeed its extreme sensitiveness to the ordinary reagents has been remarked by all those who have examined it in the fresh condition. Since, however, it is unlikely that any one will have the opportunity in the near future of examining this species in a state of nature, it seems better to place on record the facts observed, so that they may serve at all events for comparison.

This organ is mainly due to a great thickening of the epithelium of three areas in the funnel. One of these is median and lies upon the large venous sinus which passes down the ventral aspect of the animal, separated from it merely by a thin membrane, whilst the other two occupy portions of the two lateral walls of the funnel and are so situated that when the funnel contracts they become applied to the median portion of the organ (compare woodcut).



A. Transverse section through the funnel of an advanced embryo of *Sepia*, to show the form and disposition of the funnel-organ.—B. A similar section of a young specimen of *Taonius*. *m.p.*, median pad; *l.p.*, *l.p.*, lateral pads; *si.*, ventral wall of the funnel; *v.c.*, vena cava.

The cell-boundaries in my sections are very difficult to make out (Plate XIII. fig. 8); they are most distinct in the lateral portions of the median pad, and here it is clear that the pad is only one cell thick, its component elements having become extremely elongated. The nuclei are situated at various points in the cell, generally somewhere in its middle third; they are small and do not stain so deeply as usual. The distal extremities of the cells are occupied by curious highly refracting subglobular bodies. No structure whatever could be made out in these globules, even under a $\frac{1}{12}$-inch oil immersion of Zeiss; they seem perfectly homogeneous and do not take up the stain. Over the surface of the cells is spread a thin layer apparently of secreted material. It stains faintly, is dull and turbid and not strongly refractile; its upper surface is often irregular. It is most distinct a little distance from the margin.

[1] Quart. Journ. Micr. Sci. xxviii. 1888.

Towards the margins of the pads the peculiarities of the epithelium gradually disappear. The cells become shorter, their nuclei more deeply stained, and they pass by insensible degrees into the flattened pavement epithelium which lines the rest of the siphon. At the anterior extremity of the organ it is raised up into a free process, which is completely surrounded by the layer of these highly refractive bodies.

I have also examined sections of this organ in the case of *Taonius* both young and adult, in the embryos of *Ommastrephes*, *Sepia*, and *Loligo*. In its general features the minute structure of the organ is the same in all these instances, but it was only in *Gonatus* that I was able to discover the highly refracting globules described above. What the relation of these may be to the fusiform rods described by Müller and Boll I will not attempt to decide at present, but must leave any further histological discussion till an opportunity offers for describing its structure in *Taonius* and other forms where it is highly evolved.

I shall, however, venture a suggestion as to the function which it possibly discharges, because a hypothesis, even though it may eventually prove to be mistaken, affords a useful guide in subsequent researches. The theories of a sensory or of a phosphorescent purpose in this organ seem to be sufficiently negatived by its situation in a closed space through which only effete products from the body are discharged. Brock is, I think, in error when he states that the main interest of this organ is that it affords an instance of the occurrence in Mollusca of nettle-cells or of bodies allied to them. To my mind the resemblance to nettle-cells is purely superficial. Müller, who noted it, distinctly remarks that they have no filament, and Boll, as above mentioned, did not think that they were so much like nettle-cells as like the rod-bearing cells of the Turbellaria—an opinion which is fully borne out by his figures. The view that the modified epithelium discharges some secretion seems on the whole the most feasible, and is supported by the existence of the structureless layer observed on the surface of the epithelium, which, it may be remarked, is of considerable thickness in the adult *Taonius*. The difficulty hitherto has been to discover the purpose served by this secreted matter.

I would suggest that possibly this funnel-organ is an apparatus for the closure of the funnel, that it is, in fact, functionally, though not morphologically, a valve.

I am led to this conclusion by the following considerations:—

1. The fact that in a very large number of sections which I have examined the pads are so disposed as to very nearly, if not quite, occlude the lumen. I need only refer to the two instances figured in the woodcut as examples.

2. The fact that in those forms in which the organ is most highly differentiated in the adult the valve is absent, as for example in the genus *Taonius*.

3. In this case the presence of a sticky or viscous secretion would be of obvious utility in securing the more perfect apposition of the

surfaces of the pads. This idea is supported by the observations that in some sections the pads could be seen firmly pressed together with a thin line of structureless material between them. The fusiform or rod-like bodies within the cells might be compared with the structures found in those cells of *Cercaria* which secrete the cyst (cellules à batonnet)[1].

The suggestion just made with regard to the function of the funnel-organ is by no means free from difficulties. Of these the most serious is that it persists in the adults of those forms which have a well-developed valve in the siphon. Its discharging one function in the embryo is not necessarily, however, a bar to its having some different use in the adult.

The objection that in those embryos in which it is well formed (*Sepia*, *Loligo*) there is a valve in the funnel, may be answered by the hypothesis that in these small animals the valve is inadequate. I have seen some sections of *Sepia* in which the valve would certainly be quite insufficient to close the lumen of the funnel, unless this latter were to contract very considerably by its own proper musculature.

Another weighty argument which may be raised is, that this seems a circuitous mode of obtaining the end desired, that if a valve is to be developed it would be best to have it ready for use by the time the embryo quits the egg. Nothing in the way of proof can be urged against this, but it may be remarked that natural processes often seem to us at first sight to be very roundabout in their way of operation. The whole subject is well worthy the attention of any observer who has the opportunity of working it out more thoroughly on fresh material.

XII. *General Conclusions.*

The information now in our hands for instituting a comparison between *Gonatus* and its nearest allies *Onychoteuthis* and *Enoploteuthis* may perhaps be most conveniently summed up in the form of a table. For a number of facts regarding the latter two genera, which I have not had an opportunity of verifying for myself, I must acknowledge my indebtedness to the thesis of my friend Dr. Brock[2].

[1] Sonsino, "Cellules à batonn. de cert. Cercaires," Arch. ital. Biol. vi. pp. 37-61 (1884); Thomas, "Life History of the Liver Fluke," Quart. Journ. Micr. Sci. xxiii. p. 127, pl. iii. fig. 20 (1883).

[2] "Phylogenie d. dibranch. Ceph.," Morph. Jahrb. vi. 1880.

Gonatus.	*Onychoteuthis.*	*Enoploteuthis.*
1. Arms (except the ventral pair) with hooks and suckers (4 rows).	Arms with suckers (2 rows).	Arms with hooks, or ho and suckers (2 rows).
2. Tentacular club with hooks and suckers.	Tentacular club with hooks and suckers.	Tentacular club with ho and suckers.
3. Tentacle with connective apparatus along the stem.	Tentacle with connective apparatus confined to base of club.	As in *Onychoteuthis*.
4. The fins extend beyond the end of the body and their cartilage slides upon the gladius.	The fins extend beyond the end of the body proper, but the pointed dorsal process of the gladius extends as far as they do.	The fins do not extend yond the end of t body.
5. Valve in funnel; also funnel-organ.	Both present.	Both present.
6. Siphono-pallial articulation simple.	simple.	simple.
7. Siphonal cartilage present.	absent.	absent.
8. Pen with phragmocone but no dorsal process.	With phragmocone and dorsal process.	Neither phragmocone dorsal process.
9. Musculi retractores capitis mediani fused in middle of their course.	As in *Gonatus*.	Musculi retractores cap mediani distinct.
10. Retractores mediani distinct from retractores laterales.	Retractores mediani fused with retractores laterales.	Retractores mediani disti from retractores l rales.
11. Nuchal muscle absent.	absent.	present.
12. Radula with 5 rows of teeth; median like those of *Onychoteuthis*.	7 rows, more complex.	7 rows, less complex.
13. Anterior salivary glands rudimentary.	small.	rudimentary.
14. Anal appendages symmetrical (in young).	asymmetrical.	symmetrical.
15. No accessory hearts on the arteries.	Accessory hearts.	Accessory hearts.
16. Oviducts in number two.	two.	two.
17. Oviducts dorsal to gill-roots.	Oviducts opening into pouch dorsal to gill.	As in *Gonatus*.
18. Nidamental glands present.	present.	absent.

From this table we may extract the following sets of resemblances and differences:—

A. *Gonatus* resembles both *Onychoteuthis* and *Enoploteuthis* in:—
(2) the fact that the club of the tentacle has both hooks and suckers, though it differs widely in their arrangement;
(5) the fact that the funnel has a valve and a funnel-organ;
(6) the simple siphono-pallial articulation;
(16) the number (though not the disposition) of the oviducts.

B. *Gonatus* resembles *Onychoteuthis* and differs from *Enoploteuthis* in:—
(4) the extension of the fins beyond the end of the body proper; though even here a difference in their relation obtains owing to the varying form of the pen, which, however, has a phragmocone in both;
(9) the fusion of the middle portions of the median retractors of the head;
(11) the absence of the nuchal muscle;
(12) the form of the median tooth of the radula;
(18) the presence of nidamental glands.

C. *Gonatus* resembles *Enoploteuthis* and differs from *Onychoteuthis* in:—
(10) the separation between the median and lateral retractors of the head;
(13) the rudimentary anterior salivary glands;
(14) the symmetrical anal appendages;
(17) the situation of the oviducts dorsal to the roots of the gills.

D. *Gonatus* differs from both *Onychoteuthis* and *Enoploteuthis* in:—
(1) the arrangement of suckers in 4 rows and in their armature;
(2) the details of armature of the tentacular club;
(3) the connective apparatus of the tentacles;
(4) the exact relation of the end of the body to the fins;
(7) the presence of a siphonal cartilage;
(8) the form of the pen;
(12) the radula;
(15) the absence of accessory hearts.

In regard to A the most noticeable fact is that no points of importance have been elucidated in which *Gonatus* resembles both the other forms under consideration except such as are also common to a much larger number of forms.

The characters grouped under D are, I think, sufficient to justify the step taken three years ago in making this genus the type of a new subfamily *Gonatidæ*, for there can be no doubt that it is incomparably further removed from *Onychoteuthis* and *Enoploteuthis* than they are from each other.

The question which of these two genera it more nearly resembles is more difficult to settle; but I should be disposed on the whole to attribute more weight to the characters which ally it to *Onychoteu-*

this. The presence of a phragmocone, the absence of the nuchal muscle, the form of the median tooth of the radula, and the presence of nidamental glands are all points of considerable importance, whilst the size of the anterior salivary glands is merely a matter of degree, and the form of the anal appendages in the adult *Gonatus* is unknown. The fusion of the median retractors in one is, so to speak, balanced by their separation from the lateral retractors in the other. The other remaining point, namely the opening of the oviducts into special cavities in *Onychoteuthis*, does not seem sufficient in itself to contravene the resemblances on the other side.

Summary.

In addition to the general sketch of the anatomy of an interesting form, the preceding pages record the existence of several tracts of cartilage hitherto unobserved in the Cephalopoda, and give details regarding the structure of the pen-sac and the development of the pen, as well as new facts regarding the structure of the funnel-organ. The genus *Gonatus* is regarded as being somewhat more nearly related to *Onychoteuthis* than to *Enoploteuthis*, but as much further removed from both than they are from each other. The creation of the subfamily *Gonatidæ* is held to be justified.

In conclusion, I have to fulfil the pleasant duty of thanking Mr. Robert Gray for some of my materials, Professor Huxley for his kindness in allowing me the use of his workroom, and Professor G. B. Howes for the friendly interest he has taken in my work and for numerous acts of kindness during its performance.

EXPLANATION OF THE PLATES.

These letters have the same signification throughout.

a. Anus.
a.ao. Anterior aorta.
br. Gills.
br.a. Branchial artery.
br.h. Branchial heart.
br.h'., *br.h''*. Branchial hearts.
b.g. Buccal ganglia.
br.g. Branchial ganglia.
br.v. Branchial vein.
c. Cæcum.
ce. Cerebral ganglia.
co.', *co''*. Inner and outer limbs of the collaris muscle.
cp. Plug of cartilage in the hinder extremity of the pen-sac.
d.g. Digestive gland.
e', *e''*. Epithelium of the pen-sac.
em. Epithelium of the mantle.
g. Articular groove on the siphon.
i.s. Ink-sac.
m.m. Retractores infundibuli.
nu. Nuchal cartilage.
od. Oviduct.
œ. Œsophagus.
op. Optic ganglia.
op'. Their stem cut short.
osp. Foramen for the nerve to the osphradium.
o.v. Vein probably from the ovary.
p. Pen.
pall.v. Pallial vein.
pan. "Pancreas."
p.ao. Posterior aorta.
p.gl. Pericardial gland.
p.n. Pallial nerve.
p.v. Pedo-visceral ganglia.
p.v.c. Posterior vena cava.
r. Rectum.
re. Renal sacculi on the veins.
ri. Ridge for pallio-siphonal articulation.
s. Stomach.
sep. Rudimentary septum of the phragmocone.
s.g. Stellate ganglia.
s.nu. Supra-nuchal cartilage.
su.g. Supra-gladial cartilages.
v. Ventricle.
v.c. Vena cava.
v.f'., *v.f''*. Venous foramina in the cephalic cartilage.

PLATE XIII.

Fig. 1. The central nervous system and the stellate ganglia, from above: × 2.
2. The same from the side; the stellate and optic ganglia having been removed.
3. The circulatory organs seen from the dorsal surface: nat. size.
4. The digestive tract of one of the small specimens, seen from the side: × 3.
5. One of the small specimens opened down the ventral middle line to show the mantle-cavity; to the right an opening has been made into the renal sac: × 3.
6. The cephalic cartilage; A from the left side, B from above: nat. size.
7. Ventral view of the funnel of one of the larger specimens, to show the cartilages in its wall: nat. size.
8. Part of a transverse section of the median pad of the funnel-organ: × 175; the details added under a higher power.

PLATE XIV.

Fig. 1. Transverse section of the pen-sac and dorsal portion of the body of one of the small specimens: × 175.
2. Somewhat oblique section through the posterior extremity of one of the smaller specimens: the piece of tissue between the pen and the apex of the pen-sac has been included, owing to the obliquity of the section: × 55.
3. Longitudinal section through the posterior extremity of another of the small specimens: × 55.
4. Transverse section through the anterior extremity of the pen-sac: × 175.

March 19, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Mr. W. B. Tegetmeier, F.Z.S., exhibited and made remarks on a specimen of a female Gold Pheasant (*Thaumalea picta*) which had assumed nearly complete male plumage.

Mr. Tegetmeier also exhibited a pair of distorted horns of the Ibex of Cashmere (*Capra sibirica*), in which the horns met in front and crossed each other.

The Secretary laid upon the table a list of the species of Fishes contained in several collections made at Constantinople by Dr. E. D. Dickson, C.M.Z.S., and forwarded to the Society.

The list had been prepared by Mr. G. A. Boulenger, F.Z.S., and contained the names of 66 species; amongst these were two specimens of a species of Trout from Broussa, which, although resembling *Salmo fario*, were, according to Dr. Günther, probably referable to a distinct species. Further specimens, however, were required for their accurate determination.

The Council had agreed to deposit these collections in the British Museum of Natural History in the name of the Society.

The following papers were read :—

1. On the Generic Position of the so-called *Physæ* of Australia. By the Rev. A. H. Cooke, M.A., F.Z.S.

[Received February 25, 1889.]

The freshwater Mollusca of Australia, regarded as a whole, present only one feature which can be considered at all remarkable, namely the extraordinary development of the genus *Physa*. In a valuable paper "On the Freshwater Shells of Australia"[1], Mr. E. A. Smith enumerates no less than 52 species of this genus. It is true he admits that some of these are undoubtedly synonymous with others[2]; but even if we were bold enough to reduce the number by half, 26 would still remain a large proportion. This is especially evident when we recollect that only eight or nine species of Australian *Limnæa* are known, and only about seven of *Planorbis*. Professor Tate and Mr. Brazier, in their 'Check-list of the Freshwater Shells of Australia'[3], enumerate 54 species of *Physa*[4], "more than half [the number] for the whole world."

These Australian *Physæ* present, as a group, certain well-marked characteristics. They are, as a rule, remarkably large, thick shells, sometimes gibbous, sometimes much acuminated, sometimes surrounded with sharp ridges or keels. The columellar fold is generally strong, and in many cases there is present a stout epidermis.

It does not appear that the animal of many of these species has been examined in order to see whether they had anything in common with *Physa* besides the possession of a sinistral shell. One would have thought that the presence or absence of the tongued mantle, reflected over the shell, would have been noticed whenever the animal had been examined.

This group of *Physa* is not peculiar to Australia, though it finds its most extensive development there. Shells of exactly the same facies occur in New Caledonia[5] (14 species), Tasmania[6] (12 species), New Zealand[7] (8 species), Tonga Islands[8] (2 species), Viti Islands[9] (2 species), New Guinea[10] (3 species). This fact confirms the close

[1] Journ. Linn. Soc., Zool. xvi. 1883, pp. 255–317.

[2] I have noted the following as probable:—*proteus*, Sowb.,=*pyramidata*, Sowb., +*dispar*, Sowb., +*pectorosa*, Conr., +*breviculmen*, Sm., +*badia*, Ad. and Ang., +*concinna*, Ad. and Ang., +*texturata*, Sowb.: *gibbosa*, Gld.=*producta*, Sm., +*beddomei*, N. and T., +*fusiformis*, N. and T.: *reevei*, Ad. and Ang.,=*carinata*, H. Ad., +*obesa*, H. Ad., +*truncata*, H. Ad., +*bonus henricus*, Ad. and Ang., +*cumingii*, H. Ad.

[3] Proc. Linn. Soc. N. S. Wales, vi. 1882, pp. 552–569.

[4] Including Tasmanian species.

[5] Various papers in the 'Journal de Conchyliologie.'

[6] R. M. Johnston, Proc. Roy. Soc. Tasm. 1878, pp. 19–29.

[7] Tenison-Woods, Proc. Linn. Soc. N. S. Wales, iii. 1879, p. 139.

[8] Mousson, Journ. de Conch. 3rd ser. xi. 1871, pp. 17, 18.

[9] Mousson, Journ. de Conch. 3rd ser. x. 1870, pp. 130, 131.

[10] Tapparone-Canefri, Ann. Mus. Gen. xix. 1883 (two species common to Australia).

relationship between these groups of the South Pacific, which is already indicated by the distribution of *Rhytida*, *Janella*, and *Placostylus*.

The object of this paper is to show that these so-called '*Physæ*,' the sole claim of which to the title is that they are sinistral fresh-water-shells, are not *Physæ* at all, but a group of sinistral Limnæidæ, characteristic of the geographical area above indicated, and also of another part of the world, where their presence is of extreme interest.

This view rests primarily upon an examination of the radula of some of the species concerned.

As is well known, the radulæ of the Physidæ and the Limnæidæ are essentially different, and tend to remove *Physa* much further away from *Limnæa* than are either *Planorbis* or *Ancylus*. Fischer describes them as follows[1]:—

PHYSIDÆ.	LIMNÆIDÆ.
Radula composed of teeth obliquely arranged; central tooth multicuspid; laterals and marginals pectinate or serriform, and provided with a special narrow appendage on the upper and exterior edge.	Teeth of the radula in horizontal rows, bi- or tricuspid [central tooth bi- or tricuspid, never multicuspid]; marginal teeth serriform[2].

In the 'Journal of Conchology,' v. 1887, pp. 241–243, I described, under the name of *Limnæa physopsis*, a new species of these Australian '*Physæ*.' The reasons given for believing the species to be Limnæidan and not Physidan were based on (1) a consideration of the radula, and (2) the general facies of the shell. It was suggested, purely on grounds of general similarity of *shell*, that two other Australian species of '*Physa*,' viz. *P. hainesii*, Tryon (=*latilabiata*, Sowb.), and *P. newcombi*, Ad. and Ang., were also Limnæidæ.

Since that date several other species of this group of '*Physa*' have been examined, and with similar results. It may at once be asserted that, in spite of the 52 or 54 species enumerated, *Physa* has yet to establish its claim to be an inhabitant of Australia. Every species as yet, which has been examined anatomically, turns out not to belong to that genus; and I am strongly of opinion that further investigation of the animals of the species as yet known only by the shells will afford more evidence of a similar kind.

The note of suspicion has already been sounded more than once with regard to these Australian *Physæ*. Mr. R. M. Johnston has noticed a "peculiar arrangement" of the lingual teeth in *P. tasmanica*, the medials of which are 2-cuspid, the laterals 4-, 5-, and 6-cuspid, the extreme ones having a resemblance to the closed digits of the hand[3].

[1] Manuel de Conchyliologie, pp. 503, 510.

[2] It may be remarked that this description is inadequate, so far as *Ancylus* proper is concerned.

[3] Proc. Roy. Soc. Tasmania, 1878, pp. 19–29: he uses the term laterals to include marginals as well.

Professor Hutton, examining "*Bulimus gibbosa*, Gld. (*Physa*)?," notices that the edge of the mantle is simple and not reflected over the shell; that the radula has 126 rows, with formula 27–1–27; he goes on to characterize the teeth at length. *Bulimus variabilis*, Gray (*Physa*), is also described as being similar in form of radula, rows 112, formula 18–1–18; and the belief is expressed that probably the other species of *Physa* described from New Zealand will all be found to belong to the same genus[1].

Professor Tate has expressed a belief that the sinistral spiral Pond-Snails of Australia have been incorrectly placed in the genus *Physa*. He remarks[2] that in no instance has he found in the species those distinctions which characterize *Physa* as separate from *Bulinus*. He observes that the mantle-margin is neither expanded nor digitate, and he catalogues 10 species as *Bulinus*.

Tapparone-Canefri describes[3], as belonging to *Physa*, the new section *Physastra* with the single species *Ph. vestita*. From his description of the shell, however (form of *Limnæa*, but sinistral, thicker than the common type of *Physa*; surface not shining, but covered with a somewhat thick epidermis, which easily comes off when dry), it is plain that he is dealing with a specimen of the group now under investigation. He figures the specimens, but his examination of the animal was unfortunately not successful.

The following species of this group have been examined[4], and the results appended have been arrived at:—

General Characteristics.

Radula long, rather broad, consisting of 140–220 rows; central tooth not equal in size to first lateral, bicuspid; cusps rather blunt; laterals and marginals together about 30–40 in number; laterals 7–12, tricuspid; cusps not much differing in length; passage to marginals gradual; marginals serrate, often much curved at extreme edge, where they become very small and less serrate.

PHYSA GIBBOSA, Gld. (figs. 1, 1 *a*).

Radula with about 144 rows; cusps of central tooth very blunt; laterals 7–8, horizontal. Formula 22–8–1–8–22.

Hab. Australia.

PHYSA PROTEUS, Sowb. (figs. 2, 2 *a*).

Radula with about 83 rows (specimen probably imperfect), very similar to *gibbosa*. Formula 27–8–1–8–27.

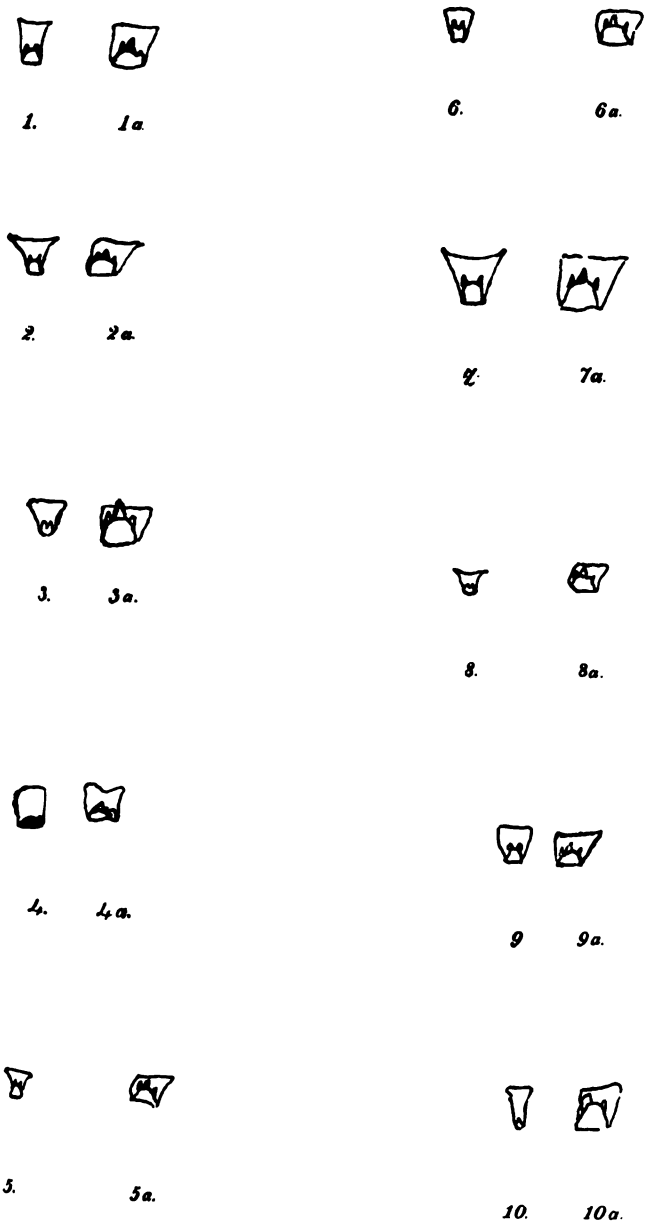
Hab. Australia.

[1] Trans. N. Z. Inst. xiv. 1881, p. 155. *Bulimus* must surely be a misprint for *Bulinus*, and the formula of *B. variabilis* is a little suspicious.

[2] Trans. Roy. Soc. S. Austr. v. 1882, p. 51.

[3] "Fauna Malacologica della Nuova Guinea," Ann. Mus. Stor. Nat. Genova, xix. 1883.

[4] All the specimens have been prepared by and are in the collection of Mr. H. M. Gwatkin, M.A., of St. John's College, Cambridge.



Central and first lateral Teeth of so-called *Physæ*, &c.

Fig. 1. P. *gibbosa*. Fig. 2. *P. proteus*. Fig. 3. *P. sinuata*. Fig. 4. *P. tabulata*. Fig. 5. *P. aliciæ*. Fig. 6. *P. multistrigata*. Fig. 7. *P. physopsis* Fig. 8. *P. scalaris*. Fig. 9. *Planorbis corneus*. Fig. 10. *Limnæa stagnalis*.

PHYSA SINUATA, Gld. (figs. 3, 3 *a*).

Radula with about 83 rows (specimen probably imperfect); laterals rather more extensive than in the other species; outer cusp very small. Formula 25–12–1–12–25.

Hab. Viti Islands.

PHYSA TABULATA, Gray (figs. 4, 4 *a*).

Radula with at least 220 rows; extreme marginals very much curved. Formula 32–8–1–8–32.

Hab. New Zealand.

PHYSA ALICIÆ, Reeve (figs. 5, 5 *a*).

No special features. Formula 25–7–1–7–25.

Hab. Australia.

PHYSA MULTISTRIGATA, Tate (figs. 6, 6 *a*).

Formula 30–8–1–8–30.

Hab. Australia.

PHYSA PHYSOPSIS, Cooke (figs. 7, 7 *a*).

Radula large, rows about 140; laterals numerous. Formula 30–9–1–9–30.

Hab. Australia.

PHYSA SCALARIS, Dkr. (figs. 8, 8 *a*).

Rows about 140, not so much curved as in the other species; passage between laterals and marginals not distinctly marked. Formula about 25–7–1–7–25.

Hab. Angola.

Several interesting facts follow on this investigation. In the first place, the teeth of the radulæ bear a very striking resemblance to those of the African genus *Isidora*, Ehrenb. So far as I am aware, the radula of *Isidora* has only once been figured, namely by Jickeli in his 'Fauna der Land- und Süsswasser-Mollusken Nord-Ost-Afrika's'[1]. The resemblance amounts to identity; in *Isidora* the central tooth is squarish, bicuspid, the laterals tricuspid, the marginals serrate, just as in these Australian '*Physæ*,' and the shells present no difference whatever. Fischer, therefore, is quite right[2] in regarding the Australian and African genera as the same, and thus a most remarkable link is established between the molluscan fauna of Australia and Africa, a link in the chain of evidence already afforded by the existence of the carnivorous Land-Shells (*Rhytida*) in both Continents, and, amongst the marine Mollusca, by the occurrence of identical species of such littoral shells as *Purpura* and possibly of *Littorina*.

In the next place, the relation of the group is much closer to *Planorbis* than to *Limnæa*. A comparison of the central tooth and first lateral of *Plan. corneus* and of *Limn. stagnalis* (see figs. 9, 10,

[1] Nova Acta Ac. Nat. Cur. xxxvii. 1875, Taf. iii. figs. 2–4.

[2] Manuel de Conchyl. p. 509.

p. 139) with the same teeth of these *Bulini* will make this clear. In *Planorbis* the central tooth is broad-based, bicuspid, while the laterals are tricuspid; in *Limnæa* the central tooth is long and narrow, unicuspid, while the laterals are bicuspid. A *Bulinus*, therefore, is not so much a sinistral *Limnæa* as a spiral *Planorbis*. Further research, as the animals of more species are investigated, may, perhaps, bring out some points of difference leading to division into subgenera of the Australian and Austro-Polynesian species. It is possible that the somewhat wing-shaped form of the central tooth in some cases (see figs. 2, 3, 5, 7, 8, p. 139), as compared with its more regularly square shape in others (see figs. 1 and 4), may indicate a basis of subdivision; but at present there does not seem sufficient material to work upon.

Finally, as regards nomenclature.

Adanson, in 1757, described and figured[1] under the name of Le Bulin or *Bulinus* a small sinistral freshwater shell from Senegal, length 1¼ lines, breadth ¾ line. The shell is evidently not adult, but the description and magnified drawing of the animal, which shows none of the produced mantle-lobes of a true *Physa* (indeed, Adanson fortunately remarks, "le manteau tapisse tout l'intérieur de la coquille sans sortir au-delà des bords de son ouverture"), are sufficient to enable us to recognize it as belonging to the genus now under investigation. Fischer, therefore, is quite right in adopting *Bulinus* as the generic name[2].

Isidora (Ehrenb. 1831) is a synonym, see Jickeli, *loc. supr. cit.*

Fischer, in his 'Manuel,' goes on to enumerate five subgenera, viz. *Pyrgophysa*, *Plesiophysa*, *Ameria*, *Glyptophysa*, and *Physopsis*.

Pyrgophysa was proposed by Crosse[3] for *Ph. mariei*, Crosse, from Nossi-Bé, on the ground of its turreted spire. But this subgenus is of little value, as the Australian species present every variety of such formation. Crosse's description of the shell ("haud nitens, vestimento opaco induta") makes it plain that it belongs to this genus.

Plesiophysa (Fischer, 1883) includes the remarkable *Ph. striata*, d'Orb., from Guadeloupe. This must be the '*Physa* sp.' from Point à Pitre[4], the radula of which is described by Bland and Binney[5] as follows:—"Central tooth 5-cusped, central of these the largest; laterals 4-cusped, one inner, large, stout; marginals a reproduction of the laterals." This description at once removes the species from

[1] Sénégal, pp. 5–7, pl. fig. 6. ii.

[2] Yet he remarks: "Etymologie inconnu." Adanson, however, *l. c.*, seems to make it fairly clear when he says:—"Cette dénomination m'a paru lui convenir, parce que l'animal pendant sa vie nage presque continuellement à fleur d'eau, et qu'après sa mort la coquille flotte comme une *petite bulle* d'air transparente."

[3] Journ. de Conchyl. 3e sér. xix. 1879, pp. 208–209; xx. 1880, pp. 141–142, pl. iv. fig. 5.

[4] Mazé (Journ. de Conchyl. 3e sér. xxiii. 1883, pp. 30–31) records *Plesiophysa striata* from Point à Pitre.

[5] "Note on a curious form of lingual dentition in *Physa*," Ann. Lyc. N. H. N. York, x. 1873, pp. 255–257, pl. xi. figs. 2, 3.

Physa. The differences, however, between its dentition and that of *Bulinus* are very considerable, the central tooth being 5-cusped, cusps sharp, instead of 2-cusped, cusps blunt, the extreme marginals being similar in character to the laterals, instead of entirely different, with no trace of serration. Further, the occurrence of the species on an island in the Antilles raises a difficulty on the score of distribution, if its close connection with *Bulinus* be pressed. It seems, therefore, better on every ground to separate off *Plesiophysa*, in the expectation that its congeners will hereafter be found rather on the South-American than the African continent.

Ameria (H. Ad., 1861) was proposed for *Physæ* with keeled whorls, *e. g. P. aliciæ*, Reeve. The distinction is untenable. Every gradation of keeling is observable in the Australian *Bulini*, and occasionally the same species is indifferently keeled or perfectly smooth.

Glyptophysa (Crosse, 1872[1], not 1870; Fischer, 'Manuel') was meant for similar shells, and must share a similar fate.

Physopsis (Krauss, 1848) has a truncated columella and lustrous shell. Fischer regards it as a subgenus of *Bulinus*, but it does not appear that the animal has ever been investigated. There is nothing, therefore, to show that it belongs to *Bulinus* rather than to *Physa*.

Physastra (Tapp.-Can., 1883) has been dealt with above.

Thus reorganized the genus will read as follows:—

BULINUS, Adans. 1757.

Etymology. Diminutive of *bulle*, a bubble.

Synonyms. *Isidora* (Ehrenb., 1831), *Diastropha* (Gray, 1840), *Ameria* (H. Adams, 1861), *Glyptophysa* (Crosse, 1872), *Pyrgophysa* (Crosse, 1879), *Physastra* (Tap.-Can., 1883).

Animal without the produced and reflected mantle-lobes of *Physa*; radula Limnæidan, approaching *Planorbis* rather than *Limnæa*; central tooth bicuspid; cusps rather blunt, base square; laterals tricuspid; marginals serrate. Laterals about 6 to 10, marginals about 25 to 33. Number of rows varying between 140 and 220.

Shell sinistral, resembling that of *Physa*, acuminated or gibbous, smooth or keeled; texture somewhat thick, covered with a deciduous epidermis; columella strong, often reflected; umbilicus sometimes very wide and deep.

Distribution. Australia, Tasmania, New Zealand, New Guinea, New Caledonia, Viti and Tonga Islands; Africa, N., N.E., W., and S.; S. France, Spain, and all countries bordering the Mediterranean[2].

? Subgenus *Physopsis* (Krauss, 1848). Animal unknown; shell with truncated columella.

Distribution. Natal.

[1] Journ. de Conchyl. 3e sér. xii. 1872, p. 151; type *petiti*, Crosse, and *aliciæ*, Reeve.

[2] Tryon (Struct. and Syst. Conch. iii. p. 101) mentions, but I have failed to trace on what authority, that sinistral Limnæas occur in the Sandwich Islands. His whole arrangement of the present group is destitute of scientific value.

Peter Smit del et lith.

Mintern Bros. imp.

1. GYMNODACTYLUS HORRIDUS
2. UROSTROPHUS SCAPULATUS.

PLESIOPHYSA, Fischer, 1883.

Animal unknown, with the exception of the radula; central tooth 5-cusped; middle cusp the largest; laterals 4-cusped, strong; marginals as the laterals.

Shell that of a *Physa*, fragile.

Distribution. Guadeloupe.

2. On some Specimens of Lizards in the Zoological Museum of Halle (Saale). By G. A. BOULENGER.

[Received March 6, 1889.]

(Plate XV.)

Having, at the request of Dr. O. Taschenberg, examined some specimens of Lizards belonging to the Museum of Halle, which have been named or described by Burmeister and Giebel, I beg leave to lay before the Society the results of my examination, and to append revised descriptions of two species from the Argentine Republic.

1. GONGYLUS MELANOGASTRICUS, Burmeister, Verz. Zool. Mus. Halle, 1850, p. 79 (*nom. nud.*), = *Chalcides viridanus*, Gravenh. The specimens are therefore not from Brazil, as stated by Burmeister.

I may add, from the examination of fresh specimens of this Lizard recently brought to me by Mr. E. B. Poulton, who collected them in Grand Canary Island, that the colour of the lower surface is a bright yellow, which turns to black after some time in spirit.

2. PLATYDACTYLUS ALBOMACULATUS, Giebel, Zeitschr. ges. Naturw. xvii. 1861, p. 59, from Banka, = *Gecko stentor*, Cantor.

3. PLATYDACTYLUS BURMEISTERI, id. ibid., from the same locality, = *G. monarchus*, Schleg.

4. PLATYDACTYLUS DEISSNERI, id. ibid. p. 60, from the same locality, = *G. monarchus*, Schleg.

References to these three synonyms have been omitted from the British Museum Catalogue of Lizards.

5. GYMNODACTYLUS HORRIDUS. (Plate XV. fig. 1.)

Gymnodactylus horridus, Burmeister, Reise La Plata, ii. p. 522.

Head once and a half as long as broad; snout a little longer than the diameter of the orbit, as long as the distance between the eye and the ear-opening; forehead plane; ear-opening oval, oblique, half the diameter of the eye. The adpressed hind limb reaches the shoulder. Digits slightly depressed at the base, with well-developed

lamellæ. Head covered with large granules anteriorly, posteriorly with minute granules intermixed with round tubercles; rostral quadrangular, nearly twice as broad as long, with median cleft above; nostril pierced between the rostral, the first labial, and three nasals; eight or nine upper and six lower labials; mental trapezoid, followed by three transverse series on enlarged flat granules. Body covered above with small granules and large trihedral tubercles, which are about as broad as long, and form sixteen longitudinal series. Abdominal scales large, cycloid, imbricate, smooth, in sixteen longitudinal series in the middle of the body. No femoral or præanal pores. Tail cylindrical, with rings of large keeled tubercles. Pale brown above, with seven darker transverse bands separated by narrow interspaces; a dark band on each side of the head, from the nostril, through the eye, to above the ear; tail with five dark-brown cross bands; lower surfaces white.

	millim.
From snout to vent	15
Head	17
Width of head	10
Fore limb	19
Hind limb	27
Tail	59

A single male specimen from Mendoza.

Closely allied to *G. fasciatus*, but differing in the larger granules on the forehead, the larger ventral scales, and the absence of regular chin-shields.

6. Urostrophus scapulatus. (Plate XV. fig. 2.)

Leiosaurus scapulatus, Burmeister, Reise La Plata, ii. p. 522 (♂).
Leiosaurus multipunctatus, Burm., ibid. p. 524 (♀).
Leiosaurus marmoratus, Burm., ibid. p. 524 (young).

Head once and two fifths as long as broad; snout rounded, with very short canthus rostralis; nostril nearer the end of the snout than the orbit; tympanum oval, larger than the eye-opening; upper head-scales smooth, smallest on the supraorbital region, in two or three series between the orbits; occipital not enlarged; a series of enlarged infraorbitals, second largest; eleven upper and as many lower labials. Gular scales small and granular, enlarged and flat near the labials and in front of the gular fold. Body subcylindrical; scales on upper surface very small, granular, of lower surfaces flat, slightly imbricate, all smooth. The adpressed hind limb reaches the ear in the male, the gular fold in the female. Tail as long as or slightly longer than head and body, not curly, covered with verticils of small, squarish, smooth scales. Pale olive above, uniform in the male, black-spotted in the female and young; tail with more or less distinct darker rings; lower surfaces whitish, throat of female spotted with black; a black vertical bar in front of the shoulder.

	♂. millim.	♀. millim.
Total length	228	200
Head	28	28
Width of head	20	20
Body	76	72
Fore limb	41	39
Hind limb	65	57
Tail	114	100

From the Sierra de Uspallata and the desert west of Catamarca.

Differs from *U. torquatus*, to which it is closely allied, in the longer head, shorter digits, and shorter tail.

EXPLANATION OF PLATE XV.

Fig. 1. *Gymnodactylus horridus*, with enlarged view of chin.
2. *Urostrophus scapulatus* ♀, with upper view of head.

3. On the occasional Persistence of the Left Posterior Cardinal Vein in the Frog, with Remarks on the Homologies of the Veins in the Dipnoi. By W. Newton Parker, Ph.D., F.Z.S., Professor of Biology in the University College of South Wales and Monmouthshire.

[Received March 8, 1889.]

According to the recent researches of Hochstetter [1], the postcaval vein arises in part independently ("Leberabschnitt"), and in part from that portion of one (Amniota) or of both (Amphibia) posterior cardinal veins which receive the venæ renales revehentes ("Urnierenabschnitt"). The part of the cardinals which lies anterior to the kidneys either disappears, or else gives rise to the azygos (and hemiazygos) veins.

In the Salamander, and apparently in most Urodeles, the right and left azygos are present normally, while in the greater number of Anura they disappear entirely in the adult. In *Bombinator*, however, they persist (Götte [2], Hochstetter), and this is also the case occasionally in *Alytes* and *Discoglossus* [3].

Howes has recently described an interesting case of the persistence of the left azygos in a female of the Common Frog (*Rana temporaria*) [4], the vessel being of large calibre and continuous anteriorly with

[1] "Beiträge zur vergl. Anat. u. Entwickelungsgeschichte des Venensystems der Amphibien und Fische," Morphol. Jahrbuch, Bd. xiii. 1887–8. "Ueber die Bildung d. hinteren Hohlvene bei den Säugethieren," Anat. Anz. ii. Jahrg. 1887. "Beiträge zur Entwickelungsgeschichte des Venensystems der Amnioten," Morphol. Jahrbuch, Bd. xiii. 1887–8.

[2] Entwickelungsgeschichte der Unke.

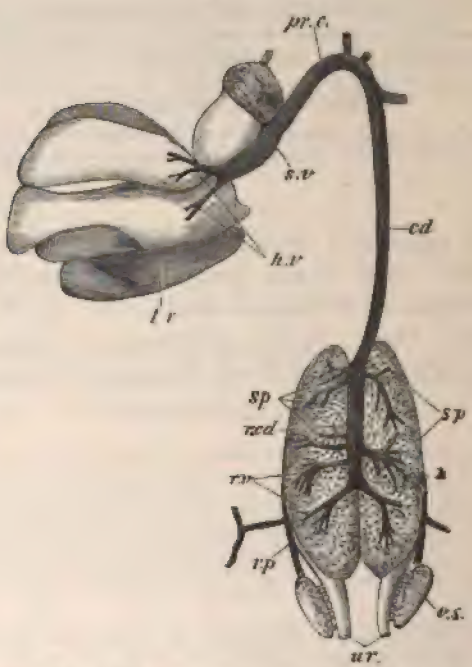
[3] G. B. Howes, "On the Azygos Vein in the Anurous Amphibia," Proc. Zool. Soc. 1888, p. 122.

[4] *Loc. cit.*

the corresponding precaval, while posteriorly it opens into the postcaval just at the anterior border of the kidneys, sending an anastomosing branch to the renal portal. Professor Howes informs me that he has since come across another Frog in which a similar arrangement occurred, except that the azygos here entered the subclavian instead of the precaval.

A week or two ago, while examining a number of specimens of

Fig. 1.



The venous system of an adult male Frog (*Rana temporaria*), in which the left posterior cardinal vein persisted, and the postcaval was absent. From the ventral aspect, ×2.

cd, left cardinal vein; *h.v*, hepatic veins; *k*, kidney; *lr*, liver; *pr.c*, precaval; *r.cd*, vessel formed by the union of the posterior part of the two cardinals, and which normally gives rise to the inter-renal portion of the postcaval; *r.p*, renal-portal vein; *r.v*, revehent renal veins; *sp*, spermatic veins; *s.v*, sinus venosus; *ur*, ureter; *v.s*, vesicula seminalis.

Rana temporaria during a class demonstration, I found that in one of them (a male) the embryonic state of the veins was retained to a still greater extent than in the cases quoted above (see fig. 1). A large vein (*cd*), having similar relations to that described and figured by

Howes (except that there was no anastomosis with the renal portal), could be seen opening into what appeared to be the inter-renal portion of the postcaval (*r.cd*). Upon further examination it was found that there was no postcaval trunk extending from this inter-renal vessel to the heart, and the apparent azygos was thus the completely persistent left posterior cardinal. The renal portion of the right cardinal must therefore have fused with its fellow in the usual manner to form the large median vessel, which ordinarily gives rise to the posterior part of the postcaval, while its anterior part disappeared, although the hepatic portion of the postcaval remained undeveloped. The left cardinal, united with the renal portion of the right, had thus to serve as the channel for all the blood from the posterior extremities, &c., except that which entered the liver by the anterior abdominal vein, which had the usual relations. The hepatic veins (*h.v*) opened directly into the sinus venosus. The spermatic vessels (*sp*) were very asymmetrical, as were the ovarian vessels in Howes's specimen.

Hochstetter states that the hepatic portion of the postcaval remains undeveloped exceptionally in the Salamander, in which case either one or the other cardinal becomes correspondingly enlarged. It is known, too, that in Man the lower portion of the left cardinal is occasionally present, and that the postcaval sometimes remains undeveloped, the blood being returned to the heart by a persistent posterior cardinal, in which case the hepatic veins open independently into the right auricle [1].

It is extremely interesting to find these exceptions to the rule that all air-breathing animals (Amphibia and Amniota) possess a postcaval, and they seem to completely support Hochstetter's views as to the mode of formation of the postcaval.

The observations described and referred to above have helped me considerably in the determination of the homology of the two veins in *Protopterus* which have usually been described as venæ cavæ posteriores. At the time when my paper "Zur Anatomie und Physiologie von *Protopterus annectens*" [2], giving a preliminary account of the work on which I am still engaged, was published, I had made only a very cursory examination of the veins, and this had led me to the conclusion that "das was man bisher bei Dipnoërn als *Venæ cavæ posteriores* bezeichnet hat, sind sicherlich keine solchen, sondern entsprechen den (allerdings einigermassen modificirten) *Venæ cardinales posteriores*."

Owing to the extreme difficulty in following out the venous system in preserved specimens of *Protopterus*, I have not even yet completely satisfied myself as to the exact relations of all the vessels. But since the above-mentioned paper appeared, I have succeeded in elucidating some important points which were then by no means clear.

Dr. Hochstetter has recently been good enough to make several

[1] Quain's Anatomy, 9th ed. vol. i. pp. 514, 518.

[2] Berichte der naturforschenden Gesellschaft zu Freiburg i. B., IV. Band, 3 Heft. See also 'Nature,' vol. xxxix. 1888, p. 9.

valuable suggestions to me by letter on this subject, for he could not believe that the two so-called "venæ cavæ posteriores" were

Fig. 2.

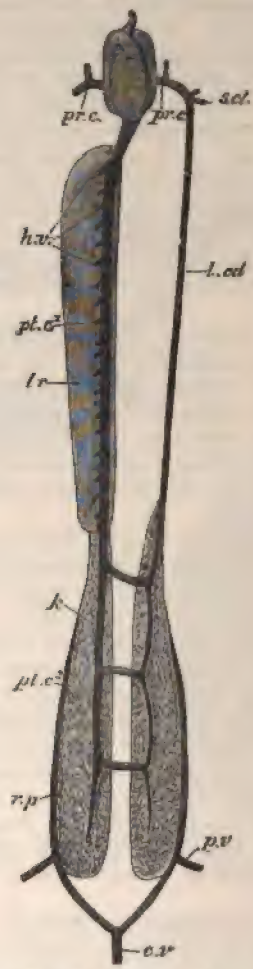


Diagram of the chief veins of *Protopterus annectens*. From the ventral aspect. — (N.B.—The veins from the body-walls and generative organs are omitted.)

c.v, caudal vein; *h.v*, hepatic veins; *k*, kidney; *l.cd*, left cardinal; *lr*, liver; *pr.c*, precaval; *pt.c*¹, hepatic portion of postcaval; *pt.c*², renal portion of postcaval; *p.v*, pelvic vein; *r.p*, renal portal vein; *s.cl*, subclavian.

really the cardinals. Although my observations on *Protopterus* do not point to a paired origin of the postcaval, as indicated by

Hochstetter's discovery concerning the paired connection between the cardinals and hepatic veins in certain Elasmobranchs, they confirm his general views as to the development of the postcaval in other types.

My statement concerning the two veins in *Protopterus* which take their origin in the kidneys and also receive blood from the body-walls and generative organs was only partially correct: that is, it was correct so far as the left vessel and the renal portion of the right one are concerned. There can be little doubt that the vein of the left side corresponds entirely with the left posterior cardinal of Fishes (fig. 2, p. 148, *l.cd*). It extends along the ventral surface of the kidney, partially imbedded in the lymphatic tissue which surrounds that organ, and then passes along the dorsal border of the corresponding gonad, between the latter and the lung, to enter the precaval, being packed in by lymphatic tissue all along its course.

The vein of the right side (*pt.c*) is considerably larger than that of the left (*l.cd*), and as it passes along the kidney it is connected with its fellow by three or four transverse anastomoses. A similar asymmetry of the two cardinals is very common amongst Fishes, and there seems often to be a tendency for one or the other to become obliterated, as occurs to a greater or less extent with such remains of them as may persist amongst the Anura and Amniota.

The liver (*lr*) of *Protopterus* abuts closely against the anterior end of the right kidney (*k*), and at this point the right cardinal (*pt.c*^{1}) is continuous with a vein (*pt.c*^{1}) which passes forwards imbedded in the dorsal border of the liver, from which it emerges anteriorly and turns medianwards so as to extend for a short distance as an independent vessel, which perforates the pericardium in the middle line to enter the sinus venosus. The liver is supported by a net-like peritoneal fold, which is connected with the mesogastrium and is continued on to the vein in its independent portion. This "Hohlvenengekröse" is characterized, according to Hochstetter[1], as being the bearer of the independently developed portion of the postcaval.

The number and arrangement of the hepatic veins (*h.v*) is rather curious. In several specimens examined there were one or two large ones entering the main vein just before it becomes free from the liver anteriorly, but besides these there are numerous small vessels all along the course of the vein through the liver.

These facts seem to prove conclusively that the right vein described above is a true vena cava inferior, which is made up of the renal section of the right cardinal and of an independently formed hepatic portion. In fact, the figure given by Howes (*loc. cit.*) of the veins of a Frog in which the left azygos persisted resembles very closely the state of things in *Protopterus*, except that the fusion of the renal section of the two cardinals does not take place, but only a reduction of that of the left side, and its connection with what must now be called the renal portion of the postcaval by transverse anastomoses.

[1] "Ueber das Gekröse der hinteren Hohlvene," Anat. Anzeiger, iii. Jahrgang, 1888, p. 905.

I have not been able to find any trace of a right azygos, that is, of the remains of the anterior part of the right cardinal.

The renal-portal veins (*r.p*) are connected with a single caudal vessel (*c.v*). They receive a pelvic vein (*p.v*) on either side as well as the posterior veins from the body-walls and generative organs, the anterior ones passing into the left cardinal and postcaval respectively.

Hyrtl's account of the venous system in *Lepidosiren paradoxa*[1] agrees in many points with the above description, although he regards the left cardinal as a left vena cava posterior. He, however, states that the caudal vein is paired, and that there is a paired azygos running alongside the aorta in addition to the two main veins which he describes as venæ cavæ posteriores. It seems unlikely that such an accurate observer as Hyrtl should have been mistaken in his observations, and I can only suppose that if the paired "azygos" is present, it is not a true azygos, but an independently formed vessel, for there can be little doubt that the left "vena cava posterior" is the left cardinal, as its relations are so similar to those seen in *Protopterus*.

A still further modification of the cardinals appears to have taken place in *Ceratodus*. Dr. Günther[2] states that a single large vena cava posterior is present, collecting the blood from the trunk, tail, and abdominal organs, except the lungs and intestine. The position and relations of this vessel are apparently similar to those of the postcaval of *Protopterus*, except that the caudal vein is said to enter it directly. Unfortunately, Günther's figures do not show the entire course of the vessels described, and it is therefore impossible to judge of their exact relations. But as a renal-portal system is present (see pl. xli. fig. 3), and also, as in fig. 2, pl. xli., the "caudal vein" is shown to enter the postcaval from the body-walls by an anterior and posterior factor so far forwards, I cannot help thinking that the vessel described as the caudal may be simply a large vein from the dorsal body-walls, and not the true caudal. I may add that in fig. 3, pl. xli., a median and two lateral veins are shown entering the renal-portal system, and these, although not described, have very similar relations to those of the caudal and two pelvic veins of *Protopterus*. The hepatic veins are numerous, as in *Protopterus*.

In enumerating the vessels which open into the postcaval, Dr. Günther mentions "a very strong vein from the left testicle, which corresponds in situation and function to the main trunk, and might be called a left vena cava posterior; but the currents of blood in the two run in opposite directions, that of the right (main) trunk running towards the head, that of the left towards the tail." According to this description, it appears that the anterior part of the left cardinal has disappeared, and that Günther's left vena cava posterior corresponds to its persistent renal portion, which now appears simply as a factor of the postcaval. If this is the case, we can compare the condition of the postcaval and cardinals to that found in most Anura,

[1] Abhandlungen der böhm. Gesellschaft der Wissenschaften in Prag, 1845.
[2] Description of *Ceratodus*. Phil. Trans. vol. 161 (1871).

except that no actual fusion of the renal portions of the two cardinals takes place. On the other hand, the state of things in *Protopterus* more nearly resembles that seen in Howes's figure[1] of the venous system of a Frog in which the left azygos was retained, as already mentioned.

A more complete description and detailed figures of the venous system of *Protopterus* I reserve until later; I have brought forward the above points in the present connection in order to make clear my former indefinite statement on the subject, and because they seem to me to be important with regard to the question of the homology of the veins throughout the Vertebrata, which is now engaging much attention. The facts I have mentioned are only some out of a great number which go to prove that a near connection must have existed between the ancestors of the Dipnoi and those of the Amphibia after they had diverged from a common piscine type, for the resemblances between the existing forms of both groups are in many respects exceedingly close. Nevertheless, certain points in the structure of the Dipnoi, more especially that of their fins, show that no *direct* relationship can exist between them and the Amphibia at the present day.

4. Notes on some Fishes new to the Australian Fauna. By J. Douglas Ogilby, F.L.S. (Communicated by Dr. F. Day, F.Z.S.)

[Received February 22, 1889.]

The present paper contains detailed descriptions of three species of fishes new to the Australian subregion, inclusive of Lord Howe Island; these are *Anthias cichlops*, *A. pleurotænia*, and *Scorpæna cookii*, not one of which appears to be well known to naturalists. I also give notes on a species of *Platystethus* from the above-mentioned island, pointing out differences which may prove to be of specific value; but owing to my limited knowledge of the genus I am loath to describe it as new; however, I append a synopsis of the known species for comparison. Finally I give a description, taken from four specimens, of the life-colours of a species of *Chærops*, which I take to be *C. ommopterus*.

Anthias cichlops, Blk.

B. vii. D. 10/16 A. 3/7. V. 1/5. P. 18. C. 15. L. l. 50. L. tr. 6/14[2].

The length of the head equals the height of the body, and is two ninths of the total length. The diameter of the eye is contained thrice and two fifths in the length of the head; the snout, which is very obtuse, is three fourths of the diameter of the eye, while the interorbital space, which is almost flat, is equal to the same. The

[1] *Loc. supr. cit.*

[2] Counting obliquely backwards from the first dorsal spine.

dorsal profile, from the tip of the snout to the origin of the caudal fin, forms a graceful and gradual curve, which is more abrupt on the head than on the body; the ventral profile is flat from the isthmus to the origin of the anal fin, behind which there is a gentle ascent. The lower jaw projects slightly beyond the upper when the mouth is closed. The cleft of the mouth is very oblique; the maxilla reaches to beneath the posterior edge of the pupil of the eye; it is exceedingly broad, being no less than three fifths of the diameter of the eye at its hinder margin, while the breadth of the preorbital bears a similar proportion to it. The nostril is provided with two openings, the posterior of which is situated on the anterior margin of the eye, on a line with the upper edge of the pupil, and is of moderate size and round, while the anterior, which is placed midway between the eye and the tip of the snout on a slightly lower level, is oval and very minute. The opercle is armed with three spines, of which the middle is much the longest, while the upper is so small as to be difficult of detection; the vertical limb of the preopercle is finely serrated, and three or four of the teeth on the rounded angle are much larger and stronger than the others; the horizontal limb is entire. *Teeth*—there are one or two small canines on the front of each ramus of either jaw, between which are patches of small teeth, separated by a naked space at the symphysis; behind the canines are small cardiform teeth in a double row anteriorly, but posteriorly in a single row, where, in the lower jaw, they are distinctly longer: the vomerine teeth form a triangular patch, the palatine a narrow band; the tongue is toothless. *Fins*—the dorsal fin commences above the base of the middle opercular spine; the spinous portion is much lower than the soft, and its base is about one tenth shorter; the spines are slender, and the variation in length is very slight, the last being the longest, and two and three fourths in the length of the head; the intervening membrane is deeply notched, and is without a filiform appendage; the soft portion increases gradually in length to the thirteenth ray, beyond which it descends rather abruptly; the longest ray is one half longer than the last spine. The third anal spine is the longest, but little shorter than the last dorsal, while its rays are much longer than those of that fin [1]. The ventral spine is one third longer than that of the anal, and the second ray, which is the longest, reaches only to the vent, and is four fifths of the length of the head. The pectoral fin is elongate and pointed, reaching to opposite the origin of the anal, and equal in length to the head. The caudal fin is deeply forked, with equally developed lobes, none of the rays of which are elongate; its length is just one fourth of the total. *Scales*—of moderate size, finely ctenoid, and firmly adherent; the basal half at least of all the fins is scaly, and the entire head is covered with scales, smaller, especially on the snout, than those of the body. The *lateral line* has a long, gentle curve parallel to the line of the back. *Colours*—head and anterior half of the body rose-coloured, with a narrow, pale blue line running from

[1] In our specimen the fourth and fifth (Bleeker's longest, *vide* figure in Atl. Ichth. t. vii. pl. xi. fig. 1) rays are broken off close to the base.

the eye to the base of the ventral fin; remainder of the body and the fins, with the exception of the spinous dorsal, which is crimson, golden; irides purple, with an inner ring of gold.

On carefully comparing this description with that of Dr. Bleeker, we find that the following important differences occur:—(1) the arrangement of the teeth in the jaws, which can by no exercise of ingenuity be stated to be "*dentibus pluriseriatis*;" (2) the absence of a lateral canine in the lower jaw; (3) the absence of denticulations on the sub- and interopercles; (4) the greater number of scales on both lateral and transverse lines, and especially that between the former and the origin of the dorsal fin, which Bleeker computes at two or three, while in our example six are plainly visible; (5) the deep notching of the interspinous membrane; (6) the shortness of the ventral fins and the non-prolongation of the outer ray of each lobe of the caudal fin as shown in Dr. Bleeker's figure, characters which, however, may possibly be sexual; and (7) the greater length of the third anal spine than the second. Regarding the length of the ventral fins, if we turn to the figure in the 'Atlas Ichthyologique' (tome vii. Perc. tab. xi. fig. 1) we find by measurement that the elongate second ray reaches exactly to the origin of the anal fin, and not to the posterior anal rays—"radio secundo producto radios anales posteriores attingente"—as stated in the letterpress; on the other hand, however, we see a vast difference in the height of the first dorsal spine, which is delineated as but little more than half the height of the second, and barely two fifths of that of the third, whereas in our example the variation in length is hardly recognizable. Notwithstanding, however, the apparent importance of these differences, we cannot consider it desirable to describe as new a fish which otherwise agrees so accurately with the original diagnosis, especially when the coloration, so far as we know, unique in this genus, is exactly similar in the two known specimens.

Our example measures three and four fifths inches, and is therefore about three fifths of an inch smaller than Dr. Bleeker's type. It was obtained last April on Lord Howe Island by Mr. E. H. Saunders, who found it dead, but quite fresh and perfect, on the beach, and the colours given are those jotted down on the spot by that gentleman.

ANTHIAS PLEUROTÆNIA, Blk.

B. vii. D. 10/17–18. A. 3/7. V. 1/5. P. 18. C. 15.
L. l. 48–49. L. tr. 6/18.

The length of the head is from four and two thirds to four and seven eighths the height of the body, three and a half times in the total length. The diameter of the eye is contained three and three fourths times in the length of the head; the snout is very obtuse and measures five sevenths of the diameter of the eye, while the interorbital space, which is strongly convex, slightly exceeds the same. The dorsal profile is much more curved than in the preceding species, but the ventral curve is very much the same; the upper surface of the head is obliquely straight. The lower jaw projects

slightly beyond the upper, and the cleft of the mouth is very oblique; the maxilla reaches to the posterior fourth of the orbit in one example, while in the other it only extends to beneath the middle of the eye; it is very much dilated posteriorly, its greatest breadth being five sixths of the diameter of the eye, while it is twice as broad as the preorbital. The nostril is provided with two openings placed close together, the posterior of which is very much the larger. The opercle is armed with three spines, of which the middle is much the longest, and the upper so completely hidden as to be difficult to find; the vertical limb and angle of the preopercle are evenly serrated, the horizontal limb being entire. *Teeth*—there are two or three small canines in front of each ramus of the lower jaw, and one or two much longer and stronger lateral ones, while between and behind these is a broad band of villiform teeth; in the upper jaw there are two canines in front of each ramus, one placed behind the other, the inner being much the stronger, and there is a row of stout cardiform teeth outside the villiform band; the vomer is furnished with a triangular patch, and the palatines with a narrow band of minute teeth, the tongue being smooth. *Fins*—the dorsal commences above the middle of the opercle; the spines are rather weak; the first four sevenths of the length of the second, which is about three fifths of that of the elongated third spine; the remaining ones are subequal in length, and not so high as the rays, some of which, near the end of the fin, exceed even the third spine; the base of the spinous is slightly less than that of the soft portion of the fin, and the interspinal membrane is but little notched and possesses a short filiform appendage. The third anal spine is the longest, rather less than one half of the length of the head, while its anterior rays are produced, so as to be three eighths longer than the longest dorsal ray, thus causing its outer edge to be deeply concave. The ventral spine is one fourth longer than the third anal, and the second ray is greatly prolonged, reaching, when entire, to the end of the base of the anal fin, and being one and a half times the length of the head. The pectoral fin is rather pointed, reaches to opposite the vent, and is equal in length to the head. The caudal fin is deeply forked, with the outer rays of each lobe filiform, and its length is three and two fifths in the total. *Scales*—of moderate size, finely ctenoid, and firmly adherent; the soft dorsal and anal fins are set in scaly sheaths, and, along with the other fins, are covered with smaller scales upon their basal half, and the entire head is clothed with scales of less size than those of the body. The *lateral line* has a gradual curve parallel to the line of the back. *Colours*—reddish brown, the fins with a yellowish tinge, especially on the outer half; a curved silvery (pale blue in life) streak runs from the cheek to the base of the caudal fin, near and parallel to the ventral profile, while a second is present, but not so strongly marked, from behind the base of the pectoral to that of the caudal fin [1].

[1] Both these lines have entirely disappeared in my specimens, which have been two years in spirit.

Dr. Bleeker having described his species from a single specimen, a redescription taken from two perfect examples is interesting; a comparison of the two diagnoses, however, reveals but slight differences, such as the larger number of pectoral rays in my specimens, a slight variation in the comparative measurements, and fewer scales on the lateral line[1]. Dr. Bleeker's type, which came from Amboyna, was of rather smaller size than those here described, which measure respectively five and a half and five and two thirds inches. For the possession of these specimens the Australian Museum is indebted to the liberality of Lieut. Roche, late of H.M.S. 'Opal,' who obtained them on the Great Barrier Reef off the north-eastern coast of Australia.

Scorpæna cookii, Günth.

B. vii. D. 12/9. A. 3/5. V. 1/5. P. 6/11[2]. C. 13.
L. l. 62–65.

The length of the head is from twice and two thirds to twice and four fifths in the total length, the height of the body from three and three fifths to four times in the same. The eye is of moderate size, and is placed high up on the side of the head; its diameter is from two ninths to one fifth of the length of the head, from five sixths to two thirds of that of the snout, and from five eighths to one half of a diameter apart. The interorbital space is deeply concave, and is furnished with a median ridge, which springs from two roots on the posterior margin of the swelling caused by the intermaxillary processes, and ends opposite to the anterior third of the eye, from which point two low lateral ridges run backwards, and bending towards each other after leaving the interorbital fossa, meet in an acute angle on the posterior third of the occiput, and are there lost without terminating in a spine; there is a naked shallow groove below the eye. The cleft of the mouth is large and but little oblique, and the lower jaw protrudes slightly beyond the upper; the maxilla reaches to the vertical from the hinder margin of the eye, and even beyond it in large examples. The opercle is armed with two long and moderately strong spines of equal size: there are five spines on the preopercle, the uppermost of which is much the longest and strongest, while the two lower are short and blunt. The outer edge of the preorbital bears several spinate points which radiate from a common centre, and is usually provided with two tentacles; there is also a strong turbinal spine, as well as one anterior and two posterior spines on the supraorbital ridge, which is either with or without tentacles, these when present being sometimes

[1] The difference in the number of scales between the spinous dorsal and the lateral line is caused by Dr. Bleeker having counted those beneath the middle of the fin, while I, adhering to my usual practice, have counted the oblique row from the base of the anterior spine.

[2] In one of my specimens there are ten dorsal and six anal rays, while the pectoral fins have on one side five branched and twelve simple rays, that on the other side adhering to the normal number; this example has also exceptionally long orbital tentacles, but differs in nowise else from the other examples.

bifid; there is also an occipital ridge armed with three strong spines, and a temporal ridge with four, the last of which marks the commencement of the lateral line, and between these two rows there is a single small spine posteriorly; beneath the infraorbital groove there is a spinate ridge terminating in the upper preopercular spine, and the clavicle bears a strong compressed spine pointing upwards and backwards. *Teeth*—both jaws are furnished with bands of villiform teeth, the inner row of which is much enlarged, especially on the mandible; there is an obtusely angular band of villiform teeth on the vomer, and a narrow band, reaching as far back as the angle of the mouth, on the palatines. *Fins*—the dorsal fin commences either opposite to or rather in front of the middle of the opercle; its spines are acute and moderately strong, the fourth the longest, but little longer than the third and fifth, and from twice and one third to twice and four fifths in the length of the head; the dorsal rays are subequal in height to the spines, while those of the anal are much longer: the anal fin commences beneath the first dorsal ray and ends beneath the eighth; its second spine is much stronger and longer than the third, and is equal to, or not much shorter than, the longest dorsal spine. The ventral fin is rounded, and reaches to, or a little beyond, the vent, and is five ninths of the length of the head; the pectoral fin is rounded, and reaches to beneath the base of the last dorsal spine; the two upper simple rays are subequal and longest, from two thirds to four sevenths of the length of the head; the caudal fin is slightly rounded, from two ninths to one fifth of the total length.

The *scales* are of small size, and there is an elongate patch of rather smaller ones extending from between the two lower opercular spines to the tip of the flap[1]. The *lateral line* bends abruptly downwards from its origin to beneath the middle of the spinous dorsal, behind which the curve is very gradual. The *colours* are similar to those in the figure given by Dr. Günther.

In the 'Journal des Museum Godeffroy' (Bd. ii. p. 78, Taf. 55), Dr. Günther describes as new and figures a species of *Scorpæna*, under the name of *S. cookii*, from a British Museum example originally brought from Raoul Island, an outlying rock in the Pacific belonging to the Kermadec Group; he mentions, however, that a fish obtained by Mr. Garrett from the Sandwich Islands is probably of the same species. During the month of September 1887, Messrs. Etheridge, Whitelegge, and Thorpe were sent by the Australian Museum, Sydney, to Lord Howe Island, where they spent three weeks, and, notwithstanding the inclemency of the weather during their stay, brought back, among other spoils, a small but valuable collection of fishes. Amongst these were eight specimens of a *Scorpæna*, which was distinguishable at a glance from the common Port Jackson forms, *S. cruenta* and *S. cardinalis*, and which I take to be Dr. Günther's species. Having therefore a good working series of specimens measuring from eight to over twelve inches in length,

[1] Neither this patch of scales nor the anterior curvature of the lateral line is shown in Dr. Günther's otherwise excellent figure.

and in so recent a condition[1], I have thought it useful to draw up the above detailed description of this handsome species, the more so as its original describer appears to have seen but one specimen, and I am not aware of its having been noticed since. The species will probably hereafter be found to occur at Norfolk Island, and on the northern shores of New Zealand, and perhaps even on our own eastern coast. Among the Lord Howe islanders it is known as the "Sandy Bay Cod," and being abundant and voracious it is taken in large numbers by means of hand-lines both from boats and from the shore for use as food, for which it is greatly esteemed. In this it must differ much from the Australian forms, which are soft, watery, and tasteless.

Mr. Saunders also collected three specimens of a *Platystephus* at Lord Howe Island, which differ from Dr. Günther's description (Cat. ii. p. 391) in the following important particulars.

Platystethus, sp. inc.

A. 3/27. L. l. 52. L. tr. 6/14.

The body is rather deeper, being thrice and three fourths in the total length; the orbit is much larger, being but thrice and one fourth in the length of the head, and one fifth longer than the snout; the maxillary reaches to the anterior fourth of the eye; the width of the interorbital space equals the diameter of the orbit. The fifth dorsal spine is the longest, one fourth of the length of the head; the pectorals are rather short, measuring one seventh of the total, while the ventrals measure one thirteenth[2] of the same. The colour of the upper part of the head and body is deep blue, each scale being ornamented with a wavy silvery mark; the remainder of the body and head is silvery; the dorsal, pectoral, and caudal fins are dusky, the anal and ventrals grey; irides brown above, golden below.

Though many of these differences may be due to the larger size of my specimens, which measure from ten to twelve and a half inches, it is certainly an anomaly to find the more adult fish possessed of eyes the comparative measurements of which are so much greater than those of smaller examples, the reverse being ordinarily the case. Should the differences enumerated above, and which are constant in my three specimens, be considered sufficient to entitle the large-eyed form to specific rank, I would suggest as a suitable name *Platystethus guentheri*, after the distinguished founder of the genus. In this case the following simple synopsis of the species may be of interest, while the generic diagnosis must be modified so far as to read "first dorsal continuous, with from eight to thirteen spines."

1. *Platystethus cultratus.* D. 8 | 1/24. A. 3/30. L. l. 60. Eye moderate, two ninths of the length of the head. Maxilla reaches to anterior margin of orbit.
2. *Platystethus guentheri.* D. 8 | 1/24. A. 3/27. L. l. 52.

[1] The description was drawn up immediately after the return of Messrs. Etheridge and party.

[2] In the measurements given by Dr. Günther at the end of his description, he makes the lengths of the pectoral and ventral fins even shorter in comparison to the total length of the specimen than in my examples.

Eye large, four thirteenths of the length of the head. Maxilla reaches beyond the anterior margin of the orbit.

3. *Platystethus huttonii*[1]. D. 13/36. A. 3/32. L. l. 90. Eye moderate, two ninths of the length of the head. Maxilla not extending to the front margin of the orbit[2].

CHŒROPS OMMOPTERUS (Rich.).

During the month of June 1888, I obtained in the Sydney market three adult examples of a *Chærops* which I believe to be identical with Sir John Richardson's *C. ommopterus*; but on account of certain constant differences in the pattern of coloration, I append a description of the life-colours, all three examples being exactly similar in this respect. They were of large size, measuring respectively nineteen, twenty, and twenty-four inches, and came from the Clarence River, New South Wales, this being the first recorded instance of the occurrence of the species within the colony, and extending its range southward by many degrees. The only difference, besides the coloration, between Dr. Günther's description and my specimens is that in the latter there are in two but nine, and in the third ten scales, in an oblique row beneath the lateral line. The colours of the fresh fish are as follows:—upper part of head green, becoming gradually more tinged with blue towards the snout; cheeks and opercles olive; mandibular region pale violet; chin sky-blue; edge of the maxillary lip with a narrow outer golden and inner blue stripe; anterior margin of the preorbital very narrowly edged with blue; an oval sky-blue spot in front of the orbit, and extending to about one third of its diameter. Body olive-brown above the lateral line, rose-coloured below, most of the scales on the back and caudal peduncle with a medium-sized, round, blue spot; a broad dark band runs from the fifth scale of the lateral line forwards and downwards in an arcuate shape to the inferior margin of the opercle. Dorsal fin golden, the spinous portion with a basal, median, and marginal band of blue, the two outer of which are exchanged on the rays for wavy, anastomosing lines of the same shade; anal fin grey, with a broad basal and marginal blue band, bordered on the inner edge by a narrower golden stripe; ventrals bluish, the membrane between the first and second rays golden; pectorals grey, with two transverse golden bands in front of the base, and the two outer rays and basal third of the others blue; caudal brownish, with the outer rays blue, and the bases of the remainder green. Irides golden and crimson, with sky-blue marginal spots.

Count Castlenau's *Torresia australis*, of which the type is unfortunately missing, is probably the young of *Chærops ommopterus*.

P.S. (Dec. 22, 1888).—Since writing the above I have received another large specimen from the same locality, which agrees exactly in coloration with those here described.

[1] From Dr. Günther's description (Ann. Nat. Hist. [4] xvii. 1876, p. 395) it appears to me that this fish has quite as good a claim to separate generic rank as many other Carangoids the right of which has never been questioned.

[2] *Platystethus abbreviatus*, Hector (Trans. N. Zealand Inst. vii. 1875, p. 247, pl. xi. f. 31 C), is a *Cyttus*.

5. Description of a new Bornean Monkey belonging to the Genus *Semnopithecus*. By OLDFIELD THOMAS, Natural History Museum.

[Received March 16, 1889.]

(Plate XVI.)

In a small collection of Mammals recently obtained by Mr. Charles Hose in Baram, on the north-west coast of Borneo, and acquired for the Natural History Museum, there occur several rare and noteworthy Mammals. Among these may be mentioned the *Trichys* recently referred to by Dr. Günther [1], specimens of *Rhinolophus luctus*, Temm., of *Sciuropterus davisoni*, Thos., only previously known from the Malay Peninsula, of *Semnopithecus chrysomelas*, Müll. and Schl., and, finally, the subject of the present description.

The specimen is an adult male, and as it occurred along with the other *Semnopithecus*, one was at first tempted to suppose that it was only a very aged individual of the same species, in which certain parts had become white; but an examination of the skull proves that it is really quite distinct.

I propose to call it

SEMNOPITHECUS HOSEI, sp. n. (Plate XVI.)

Size and form about as in *S. femoralis*, *S. chrysomelas*, and *S. obscurus*. Crown with a longitudinal crest starting about half an inch behind the centre of the forehead; the longer hairs slope evenly backwards, there being no trace of a reversed occipital tuft as there is in some species. General colour of body hoary grey, a colour made up by the intermixture of black and white hairs. Crest, centre of crown, and nape deep glossy black, as also are the long eyebrows, and the few short hairs scattered about the dark surface of the orbits. All the rest of the head, the forehead, temples, sides of the crown and neck, cheeks, lips, nasal septum, chin (where there is a distinct tuft), and front of neck pure white, contrasting most markedly with the glossy black of the central crest, and with the dark grey of the back and shoulders. Outer sides of limbs like back, darkening terminally in the hands and feet to deep black. Chest, underside of body, and inner sides of limbs as far down as the middle of the forearm and of the lower leg white, continuous with that of the chin and throat. Tail hoary grey like the back throughout, only rather darker above than below, owing to the larger proportion of black as compared with white hairs there present.

Skull light and delicate. Nasal bones long, thin; profile quite straight and continuous with the line of the forehead, an arrangement very different from the peculiar aquiline nasal outline of *S. chrysomelas*.

Nasal opening oval, its breadth about two thirds its height, instead of three fourths as in the allied species. Bullæ low, opaque. Teeth as usual.

[1] *Supra*, p. 75.

Dimensions of the type, an adult male, preserved in skin :—

Head and body (c.) 520 millim.; tail 670; hind foot 154; heel to tip of hallux 123; length of eyebrows 25–28; length of crest-hairs (c.) 40.

Skull.—Greatest length (gnathion to occiput) 91 millim.; basal length (basion to gnathion) 61; zygomatic breadth 68; nasal opening, height 15·2, breadth 10·0; nasals, length 10, greatest breadth 10; interorbital breadth 8·0; distance from outer edge of one orbit to that of the other 55·5; height of orbit 23; breadth across face, including external walls of orbits, 62; intertemporal constriction 46; brain-case, breadth 54, height from basilar suture to bregma (junction of sagittal and frontal sutures) 47; palate, length 30, breadth outside m^1. 30, inside m^1. 18·8; combined length of upper premolars and molars 26, of molars only 17·6.

This handsome new species differs from all known *Semnopitheci* in the marked contrast in colour presented by its black crest, and white forehead and cheeks, no other species having a coloration in any way resembling this. The suspicion already mentioned as to its being a senile form of *S. chrysomelas* is effectually dispelled not only by the cranial differences above described, but by the fact that Mr. John Whitehead frequently saw the species during his recent expedition to Mount Kina Balu, where he obtained a specimen at an altitude of 4000 feet. The specimen was unfortunately destroyed, and its skull only preserved; but when asked as to the characters of the original owner of the skull, Mr. Whitehead, before seeing Mr. Hose's specimen, immediately replied that it was a grey Monkey with white all over the sides of the head and throat, and that the species was fairly common in certain patches of forest on and near Mount Kina Balu.

Mr. Hose is to be congratulated on his discovery of this fine Monkey, and I have much pleasure in connecting his name with it.

April 2, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

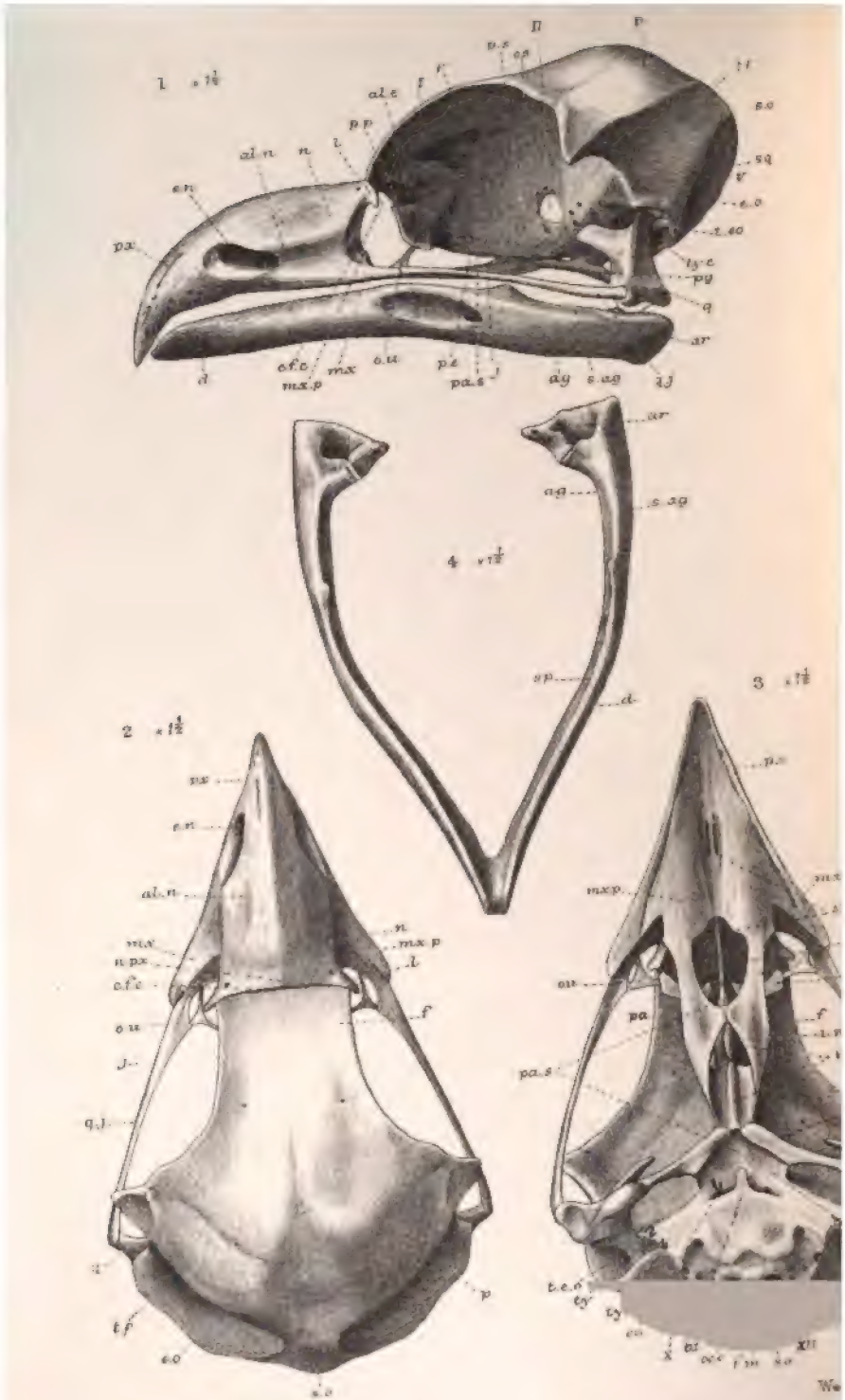
The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1889 :—

The total number of registered additions to the Society's Menagerie during the month of March was 64, of which 22 were by presentation, 2 by birth, 21 by purchase, 2 were received in exchange, and 17 on deposit. The total number of departures during the same period, by death and removals, was 100.

The following additions are worthy of special notice :—

1. A specimen of the Manatee (*Manatus australis*), said to have been received from the Amazons, and purchased of Mr. Cross of Liverpool, March 2nd, being the second[1] example of this Sirenian obtained alive by the Society.

[1] See P. Z. S. 1875, p. 529.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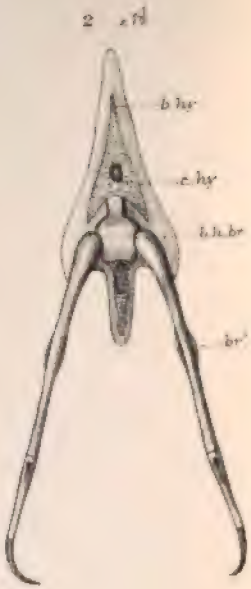
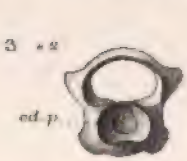
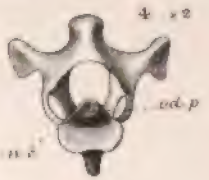
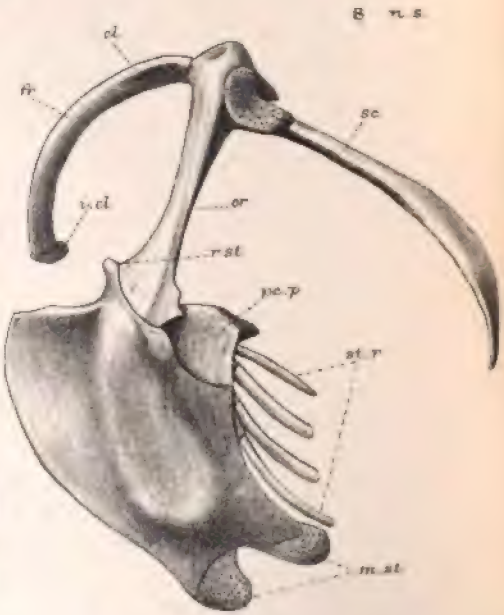
Structure of Steatornis









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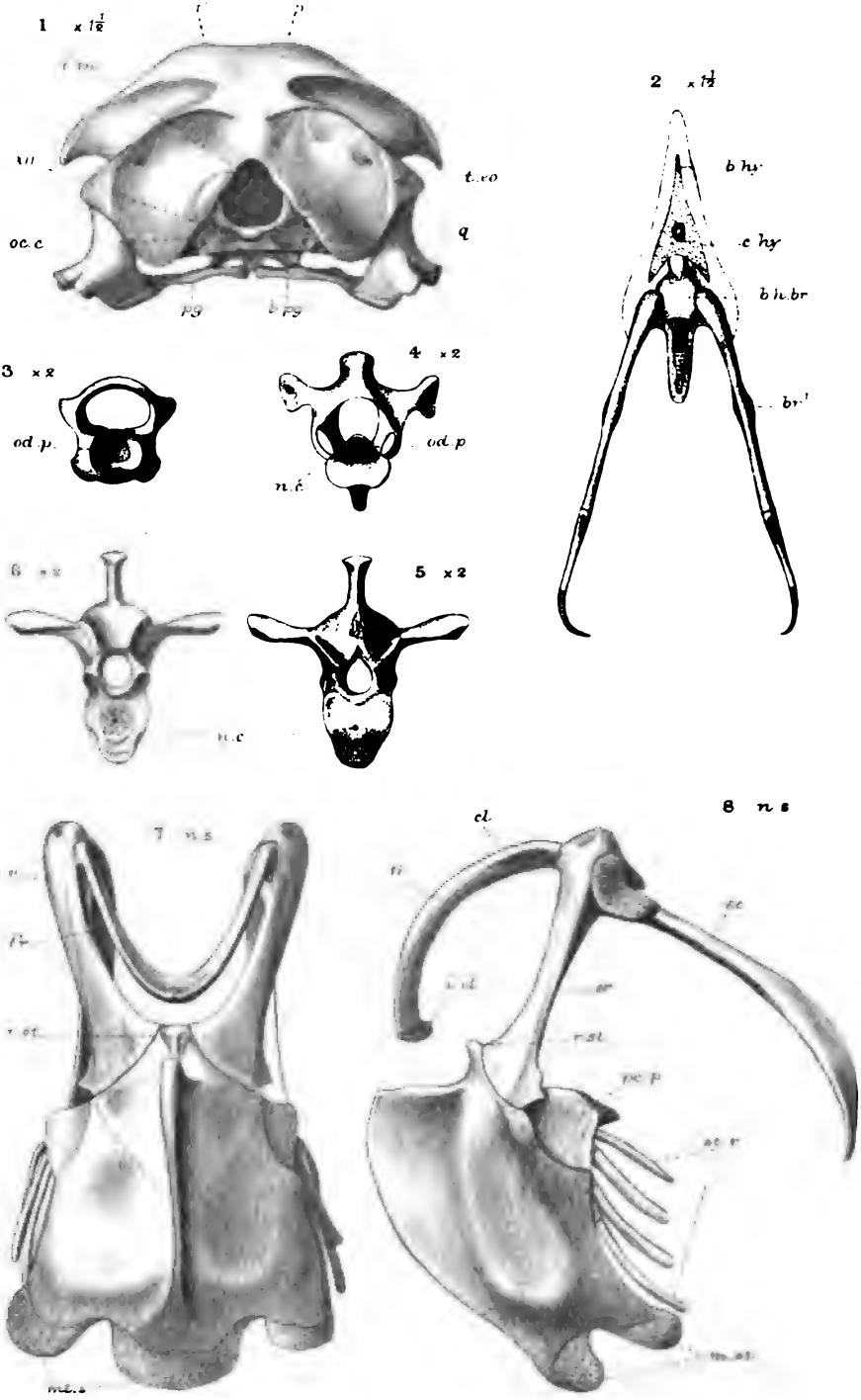
Structure of Steatornis.



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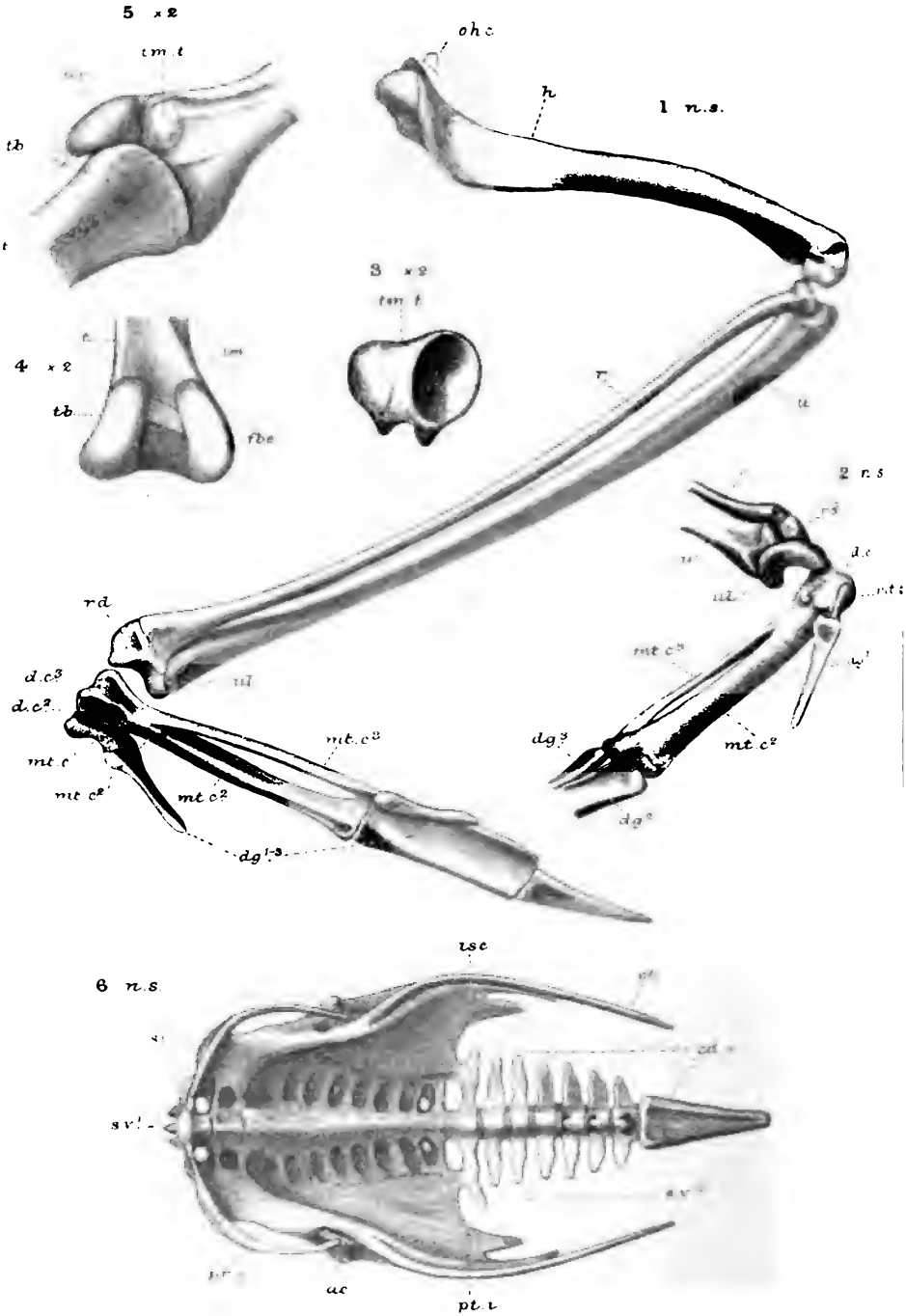
Structure of Steatornis



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West, Newman imp

Structure of Steatornis

The animal has been placed in one of the warm tanks in the new Reptile House and appears to be doing well. It is fed principally upon lettuces.

2. An Oriental Phalanger (*Phalanger orientalis*), received March 4th, and presented by C. M. Woodford, Esq., of Sydney.

Out of five specimens of this interesting Marsupial kindly transmitted to the Society by Mr. Woodford, by whom they had been obtained in the Solomon Islands, three survived to reach this country, but of these two unfortunately died before they reached the Society's Gardens.

3. A specimen of Owen's Apteryx (*Apteryx oweni*), presented by Captain C. A. Findlay, of the R.M.S. 'Ruapehu,' on March 5th.

This bird has been placed along with the specimen received on February 19th, 1889, with which it appears to agree well, so that the two are probably a pair.

Mr. A. Smith-Woodward, F.Z.S., exhibited and made remarks on a maxilla of the early Mesozoic Ganoid Fish *Saurichthys* from the Rhætic Formation of Aust Cliff near Bristol.

The following papers were read:—

1. On the Osteology of *Steatornis caripensis*.

By W. K. Parker, F.R.S.

[Received March 7, 1889.]

(Plates XVII.–XX.)

Contents.

	Page		Page
I. Introductory Remarks	161	V. The Wing	178
II. The Skull	165	VI. The Hip-girdle and Hind Limbs	180
III. The Vertebral Chain and Ribs	173	VII. Summary	183
IV. The Sternum and Shoulder-girdle	177	Explanation of the Plates	189

I. *Introductory Remarks.*

Steatornis is so distinct from every other known bird that it should, if it had its rights, be put into a Family by itself, and thus represent the *Steatornithidæ*[1], of which it is the only existing species. Its distribution is also very limited, being only found in Venezuela and one or two of the neighbouring States.

Nevertheless, this is only one among several of the Neotropical types of birds that have come very near to extinction, there being four or five families which possess at most two or three genera, with very few species.

It is evident that those groups which are most potent in Families,

[1] This has already been proposed by Messrs. Sclater and Salvin, Nomencl. Av. Neotr. p. 97 (1873).

Genera, and Species are the newest and the most specialized; this is seen best of all in the Passerine order, the "Coracomorphæ." On the other hand, we have birds that are impoverished up to the very edge of extinction, such as the "Ratitæ"—poor, stupid, savage tribes, that are fast dying out from among the noble and accomplished modern birds.

The "Order" to which *Steatornis* belongs is in great contrast with the great Passerine group; the Coccygomorphæ are little more than *one fourth* as numerous as the Coracomorphæ, yet are *ten times* as polymorphous.

Among the more than half-myriad of the Singing-birds, using the term in the broadest sense, a very small percentage of the types is abnormal; a very few have four notches to their sternum; two or three genera have their plantar tendons bound across by a special ligament—are Desmodactyle; just a few have a *tracheal*, and a few have a *simple* broncho-tracheal syrinx; whilst two genera, *Atrichia* and *Menura*, have a syrinx that just falls short of the typical perfection of that of the highest form—"the Oscines."

But all these types are Ægithognathous, and, what is most remarkable is, that that peculiar anticipation of the *Mammalian* forepalate is only found in one small family outside the Coracomorphæ, namely, the Swifts (Cypselidæ).

So that we have *one character which does not fail us* throughout the Passerine order; the sternum, the syrinx, and the plantar tendons are variable. One other character, which, however, is shared by many other birds, is the great *abortion*, mostly the complete *suppression*, of the basipterygoids; these are useful and important things for the taxonomist, but they fail him in the time of need.

The time of need is when he would make a good clear distinction between the Coracomorphæ and the Coccygomorphæ: he is bound to do this, or to cease to call himself a philosophical ornithologist; and yet can it be done?

Here, if anywhere, Professor Huxley's comprehensive terms come to be of great value, but of most difficult application. The difficulty was felt by himself, and he was thus led in his second paper (P. Z. S. 1868, pp. 294–319) to break up and spoil his excellent and most natural group of the "Alectoromorphæ," and a little more wavering of mind would have made him break up and destroy his excellent group of the Cuculines—the Coccygomorphæ. These, however, must be kept together at any cost; to enrich that order I feel willing to give up the importance of the distinctness of the Swifts, the Humming-birds, and the Parrots.

As for the Picidæ and Yungidæ, none but the most fretful and impatient of the *Classifying tribe* would have quarrelled with the present writer for demonstrating the peculiar structure of the palate in these birds, or for inventing a morphological term for that palate, namely "Saurognathous."

As for the value of the condition of this part of the bird's structure, I have just stated that it is the safest thing we have in the Coracomorphæ; but whilst that masterly and invaluable paper on the

turnæ," cannot be improved. Why they should now stand midway between Swifts and Cuckoos must be determined by those who have the power of reading and interpreting the hard sentences of Nature.

Bearing all these difficulties in mind, we may now look into the details of the supposed ancestral form of the Goatsucker type.

II. *The Skull.*

In a large, but evidently rather young, specimen the "rostrum," measured in a straight line, is 29 millim. long; the skull 37·5 millim.

In the skull of a smaller, but older, specimen the measurements are, rostrum 27 millim., skull 35 millim. The bony rostrum (Plate XVII. fig. 1) in both cases is deflected 8 millim. below the general palatal plane; this is seen to a much greater extent when the horny covering is on. Therefore, there is in this case, still more than in *Corythaix*, and other Cuculines with a decurved beak, a *quasi-Raptorial* appearance. Indeed, the skull of *Steatornis* is very much like that of the Ceylon Owl (*Ketupa ceylonensis*); a likeness which is intensified by a similar development of the "basipterygoids" in both cases. I believe that this is mere *isomorphism*.

The measurements of the lesser skull are as follows:—

	millim.
Length of rostrum	27
Length of skull, proper	35
Width of fronto-nasal hinge	11
Width of narrowest part of frontal region [1]	12·5
Width across postorbitals	34
Width across occipital wings	31
Width across quadrato-jugal hinges	35

Thus we see that the length and the greatest breadth of the skull, proper, are equal. This at once stamps the skull with an Owl-like character, which is intensified by the narrowness of the upper interorbital tract, the large size of the very open orbits (19 millim. long, 16 millim. deep), and the form of the upper beak, or "rostrum." Put side by side with the skull of *Ketupa ceylonensis*, it seems as if it must belong to an allied genus, at least; but in the details of its structure it is soon found to be Cuculine.

The skull of the Ceylon Owl and that of its Strigine congeners, like that of most Diurnal Rapacious birds, is *indirectly Desmognathous*. The skull of *Steatornis*, however, is *doubly Desmognathous* (Plate XVII. fig. 3), and has its alinasals (Plate XVII. figs. 1, 2, *al.n.*) ossified in the true Coccygomorphine fashion; these parts remain cartilaginous in the Owls [2].

[1] In the lesser skull this part is a little wider than in the two large specimens, whilst the surface is gently concave in it, and convex in the larger specimens. Are these *sexual* differences?

[2] There is, I believe, but one point in Ornithology in which I am out of touch with my friend Prof. Alfred Newton. Why he should doubt the near kinship of the Owls to the Harriers and Hawks I cannot imagine; see his remarks in the otherwise unassailable and excellent article "Ornithology," Encycl. Brit. 9th edit. vol. xviii. p. 471.

The culmen of the rostrum in *Steatornis* is subacute (Plate XVII. fig. 2); its dorsal outline forms an almost perfect quadrant, it is somewhat wavy, and drops suddenly near the hinge, which is straight across the skull, and is perfect. The nostrils (figs. 1, 2, *e.n.*) are in front of the middle of the rostrum, reniform, oblique, and 6 millim. long; a small alinasal valve, covered by the ossified roof, forms the "hilus" of the kidney-shaped opening.

These ossified roof-cartilages (*al.n.*) are full of vascular borings, which give them a different appearance to the nasals and premaxillaries (*n.*, *px.*). But the fusion (ankylosis) of these parts is perfect, and so also is that of the ossified *septum nasi*, with the surrounding bones. That wall has in its middle a large pyriform fenestra, 4 millim. long and 3 millim. deep, a structure more frequent in Aquatic and Grallatorial birds than in the higher Arboreal types. This is one of its aberrant characters; the inferior turbinal (right and left) remains unossified. Under the bulging alinasal tracts there is a gently concave, wide sulcus, which ends in an open space between the rostrum and the ectoethmoid (*pars plana*). At this part of the skull the angles of the maxillaries (figs. 2, 3, *mx.*) are 20 millim. apart; and close here, in the hollow behind the descending crus of the nasal, the projecting maxillo-palatine (figs. 1–3, *mx.p.*) is seen, right and left.

This lateral rostro-cranial space should be largely filled in by the lacrymal (fig. 1, *l.*), which is so constantly large with a considerable frontal suture, and a broad supraorbital tract, in the Cuculines generally. Here, however, in *Steatornis*, it is very small, and is ankylosed to the nasal, forming a small projection, 3 millim. in extent, to the postero-superior edge of the rostrum. This condition of things is very common in such Passeres as possess a small lacrymal; in the Corvidæ, Laniidæ, and some others it is pupiform and free.

In the Woodpecker (*Gecinus viridis*), and in that marvellously aberrant Fowl, *Opisthocomus*, the same thing is seen; the lacrymal being very small, and ankylosed to the nasal.

The margin of the rostrum is cultrate, and the dentary edge is separated by a groove from the palatine face of this region; the middle is gently ridged, and this ridge passes into the ossified *septum nasi* (*s.n.*), which in its fore half is marked off by a right and left chink. In its hinder half it is higher than, but ankylosed to, the maxillo-palatines (*mx.p.*), which swell downwards, right and left, and have a notched hinder margin. Between these parts there is another sharp notch, filled in, in front, by the bony nasal septum. The outer notches as well as the inner are in front of the maxillary angles, and the whole posterior palatal margin of the rostrum is thus strongly serrate.

The maxillo-palatines (fig. 3, *mx.p.*) are only moderately high and spongy; under their thickest part the prepalatine laths (*pa.*) pass forward and are ankylosed to them. The fibrous fore part of the prepalatines reaches as far forwards as the middle of the septum nasi; where they escape from under the maxillo-palatines they ar

3 millim. across, and together take up a space of 11 millim., measured across. They then narrow in to 2·5 millim. and enclose an oval common "middle palatine foramen" or open space 9 millim. long and 6 millim. wide; the fore end of this space is enclosed by the maxillo-palatines and septum nasi, and is, indeed, the *middle notch* just spoken of. This space is enclosed behind by the two palatines, which meet and form an oblique suture 1·5 millim. in extent.

This *second part* of the hard palate in this "doubly Desmognathous" bird is 8 millim. across; behind it the palatines narrow in again, until their lower part is a mere ridge; but they have curled round now, and formed the low and short "ethmopalatine," or ascending processes, which run under the sphenoidal rostrum for a distance of 6 millim., and are ankylosed together. Behind, the two coalesced palatines are only 3·3 millim. across, where they articulate with the pterygoid. The outer edge of each palatine is sharp, not limbate; it is bevelled into an edge from the sub-mesial thickest part.

I have spoken of the prepalatine bars as *laths*; the middle and hinder part is like a *shaving*, coiled obliquely, so that the edges of the two bones meet below, in front, and above, in their hind part. They thus enclose the naso-palatine passages (*i.n.*), flooring them in front for a short distance, and then roofing them, behind, for three times that extent. The concave opening of these passages behind the short posterior hard palate is elliptical, 9 millim. by 4·5 millim. The edge of the two bones enclosing this space is limbate, and corresponds with the inner edge of a *grooved palatine bone*; here, there is no groove, but the bone curls upwards at once, to pass into the ascending plate. This is much more *primitive*, or simple, than what is seen in the Trogons, where they do not unite to form a second part of a hard palate, and have a *groove* and some angulation of their outer edge.

Steatornis has two vomers (*v.*), each 5·5 millim. long and 1 millim. wide; they are sharp at both ends. The hinder bone has had its distinctness obliterated by ankylosis; it is probably a "mediopalatine," like that seen in *Caprimulgus*, Owls, &c.; this vomerine bone, now, forms merely an upper, partial septum between the naso-palatine passages. In a membranous tract in front of the triangular end of the fused vomer there is, at a little distance, a similar bony tract—an "antero-median vomer." The supero-external edge of each palatine, for an extent of 3–5 millim., is formed by the "mesopterygoid" increment; so that the short *trough*, 4 millim. in extent, in which the sphenoidal rostrum (*pa.s.*) lies, is formed by three pairs of bones; that rostrum runs free of this groove for 7·5 millim., its projecting point is 3 millim. behind the vertical line of the hinge, and of the notched hind edge of the septum nasi. It is extremely unlike an Owl in this respect, in which bird the *hinge-notch* is shallow and of great extent; the rostrum of the sphenoid ends much further backwards in that bird, having no projecting spike in front. The hind part of the sphenoidal rostrum, with its basipterygoid processes (*b.pg.*), may be described now, because of the relation of the latter to the pterygoids.

In the large specimens the basipterygoids have a facet for their *perfect joint* with the pterygoids 4–5 millim. in extent; these two oblongo-oval condyloid tracts are 8 millim. across in front, and 11 millim. behind; they are wider proximally than at their articular face, and project 2 millim. at their hinder notched margin. The sphenoidal rostrum is 5·5 millim. wide between their fore part, and 2 millim. over the palatine groove.

The pterygoids (*pg.*) are 11 millim. long, and measure from 1·5 millim. to 2·5 millim. in breadth. They approxmiate at a few degrees more than a right angle; in the Trogon, at a few degrees less; this greater divergence is due to the general extension in breadth of the hind skull; and the same thing is seen in Owls. The fore part of the pterygoid is oblique and tridentate, it overlaps the palatine; the epipterygoid forms a low triangle; the whole bar is arched upwards, and the bone is smooth and strong. The facet for the basipterygoid is in the middle of the shaft, and lies mainly outside an ascending flange of the bone, so that it works outside the fixed condyloid facet of the basipterygoid; it is only two thirds the length of that fixed facet, and moves beyond it, in front and behind. Thus the *capsular* ligament must be loose and elastic, as in the oblique facets in the mid-region of the neck of *Buceros* and other Cuculines.

The palatines are set on more suddenly to the "rostrum," or upper beak, than in the Trogon, where, however, they are not *hinged*; they are not hinged in *Corythaix*, but the jugals are.

These latter bones are not hinged in *Steatornis* (Plate XVII. fig. 3, *j*) and are very slender; first depressed, where they begin at the fore part of the jugal process of the maxillary, and then compressed, where they approach the quadrate, into which they fit by *gomphosis*. The hinder part of this jugal bar is formed by the quadrato-jugal (*q.j.*). The three elements of this feeble cheek are all ankylosed into one elastic needle of bone, which, in the middle, is only 0·5 millim. thick. The quadrate (*q.*) is a well-formed normal bone, in harmony with the Owl-like breadth of the hind skull: the setting on of the double hinge, or "otic process," is wide and transverse, the inner head being only about 2·5 millim. behind the outer. In the large *Strix* (*Ketupa*) *ceylonensis* these "heads" of the otic process are 12·5 millim. across; in *Steatornis* 7 millim.; in *Corythaix* 5 millim. Relatively to the size of the skull, *Steatornis* has its otic process nearly as wide as in the Owl. The quadrate has an average "orbital process;" it is oblique and pedate, and its body is deep and rather square; the cup for the end of the jugal bar is neat and pedunculate; the knob for the end of the pterygoid is well-formed; and the inferior condyle, as usual, is double.

This latter part has a hinder *trochlea* looking inwards and backwards, and an anterior oval, convex condyloid tract which is in a line with the oblique pterygoid, and just reaches its joint, which is a cup and ball.

The action of a palate like this is somewhat less rapid, and the parts themselves are much lighter and slenderer, than in many of the Cuculines, or in the Parrots, generally. This part is rather

weak in *Steatornis*; in this respect also it resembles the Owls. But it is evident that they can exert a considerable amount of force in tearing to pieces the fruits on which they feed; about equal, perhaps, to that of which an Owl is capable, whose food, however, is not ripe fruit, but small living vertebrates.

Before finishing my description of the oral apparatus, there are several things to be mentioned in the upper and hinder parts of the skull proper; besides the "remnants" of the *larval palatines*, or *ossa uncinata*.

These latter structures (Plate XVII. figs. 1–3, *o.u.*) are attached to—grow directly out of—the hind wall of the nasal capsule (*pars plana*, or ectoethmoid, *p.p.*). The whole of this wall is an oblique tract of bone 9 millim. deep and 5 millim. wide; it is notched deeply in its fore edge, at the middle; the part above the notch is the aliethmoid" (*al.e.*), the back part of the region of the upper turbinals; and the lower part, or *pars plana*, is the back of the middle turbinal region. There are no special turbinal coils to increase the surface for the distribution of the 1st, or olfactory nerve; the aliethmoid merely forms a semicylindrical fold, which runs inwards and forwards from the notch between the upper and lower regions. The aliethmoid is confluent above with the frontal roof, and behind it there is a trilobate fenestra, 6 millim. long and 3 millim. deep. This latter space is the membranous representative of the outer wall of the cribriform plate of a Mammal; the olfactory crus (I.) runs along through it to the simple nasal labyrinth. In all these things this bird is *normally ornithic*. The olfactory crura are separated by the thick top of the mesethmoidal partition wall (*p.e.*), the fore edge of which forms the hinder boundary of the great notch, which gives rise to—makes possible—the *fronto-nasal hinge*. The aliethmoid, at its ankylosis with the frontal roof, is grooved by the ophthalmic, or orbito-nasal nerve, which runs, outside the olfactory crus, into the nasal labyrinth, to supply its antero-inferior region, to which the nerve of smell does not come. On the right side one, on the left two, small perforations are seen at the root of the pars plana.

Now this ectoethmoid (pars plana) *is continuous with* the anterior crus of the cartilaginous palato-quadrate arch in the Tadpole, and also in the adult Frog: in the Salmon and other Teleostei, and also in the Urodeles, this crus *articulates* with the ectoethmoid. The fore part of that arch is naturally divisible into three regions, namely—the *ethmo-palatine*, *pre-palatine*, and *post-palatine*. Here in *Steatornis*, and also in *Todus*, the part called the "os uncinatum"—so well known in Musophagidæ—is triradiate; thus it has all the *three* regions seen in its homologue in the Ichthyopsida. Of course it is small, and degenerates into membrane at the end of its rays; but it is an extremely archaic,—a truly primitive structure, and is built up amongst the *newer, functional* parts of the palate. In passing, I may state my experience of the presence of this almost functionless *remnant*. It is well developed in *Steatornis*, *Todus*, the Musophagidæ generally, in *Scythrops*, where it is very large and perfect, and in *Piaya cayana*, where it is a simple vertical needle of bone; is

large in the Raptorial *Dicholophus*, and also in the Procellariidæ. In the Laridæ it is smaller, and in the Alcidæ (*Alca torda*, *Uria troile*) it is a mere rudiment composed of one or two independent bony nuclei at the infero-external angle of the pars plana[1].

It is worthy of remark that the palato-quadrate arcade of the Ichthyopsida, although appearing *here* and *there* at *hap-hazard*, as it were, in the families, shows one part in the birds just mentioned, and another in the Passerines. In these latter birds I have found no *distinct* "os uncinatum," merely a knob or outgrowth of the pars plana representing that bone. But in all these culminating types there is a special apparent outgrowth of the palatine bone at its postero-external angle (see Trans. Zool. Soc. vol. ix. pl. lv. figs. 1, 5, 6, and 13, *t.pa.*); this is formed by the independent ossification of a considerable part of true hyaline cartilage, which is in reality the reappearance of the horizontal part of the "palato-quadrate" bar of the Ichthyopsida. In *Steatornis* the form of the "os uncinatum" (*o.u.*) is that of an inverted T: the stem is attached to the antero-inferior edge of the pars plana, the front ray runs upon and is attached to the angle of the maxillary, and the hind crus is attached to the inner edge of its jugal process. In contemplating these things we are let down, so to speak, not merely to the *Reptilian*, but to the *larval Amphibian* level. The supraorbital chain of bones, seen in the Tinamous and some other birds, the sutures in the skulls of those Gallo-struthious birds, and the opisthocœlian dorsal vertebræ of many birds, only let us down to the *Reptilian level*.

But the "os uncinatum," the post-palatine, and the remarkable *squamosal* of the Ratitæ—the true representative of the "temporo-mastoid" of the Amphibia—*squamosal and preopercular* in one, these structures show that the ancestors of the bird-kind were once on the lower Ichthyopsidan level.

They could not, at that time, have been in a *feathered stage*; that form of covering cannot be imagined as clothing a kind of *Tadpole*; but *a kind of Tadpole* my have undergone metamorphosis into a creature whose clothing was of feathers.

The free edge of the perpendicular ethmoid (*p.e.*), behind the notch, has a convex outline above, and a concave outline below; the parasphenoidal rostrum (*pa.s.*) (Plate XVII. figs. 1 and 3) projects forwards here as a sharp spike; that grooved beam forms a common basis to the perpendicular ethmoid in front, and to the basisphenoid behind; the presphenoid (*p.s.*) is tilted up above their junction, as in birds generally. The orbito-sphenoids (*o.s.*) are scarcely developed as distinct alæ. The interorbital wall, made up of all these parts, is completely ossified and is moderately thick. The orbital rim ends behind in a triangular postorbital process 5 millim. in extent; it is over the notch leading to the moderately shallow, concave, temporal fossa (*t.f.*), which is only 5 millim. from its fellow of the opposite side, and is 10 millim. broad below.

[1] Proc. Roy. Soc. 1888, pp. 394–402.

There is no zygomatic snag to the *squamosal*, which at its anterior corner clamps a very short "sphenotic process" of the alisphenoid. The bone in front of the squamosal and sphenotic, formed above by the frontal, and below by the alisphenoid, makes a perfect back-wall to the orbit, and floor to the tilted cranial cavity; this is a *closed*, not a *fenestrate* skull. The low, smooth, wide occipital plane (Plate XVIII. fig. 1) is emarginate above, and slants backwards, so as to form an obtuse angle with the base. The foramen magnum (*f.m.*) is pyriform, with the narrow end above; the condyle (*oc.c.*) is reniform and transverse, 2 millim. by 1·3 millim. in size. Where the basitemporals (Plate XVII. fig. 3, *b.t.*) are fused with the upper outgrowths of the basisphenoid, to form the openings of the "anterior tympanic recesses," there they are 18 millim. across; behind they are 13 millim. wide, and their average width is 3 millim.,—very narrow as compared with the great, massive, triangular plate formed by these two bones in Geese and Fowls. In front they form a projecting lip, and a narrow tongue of bone grows from the middle of this neat lip under the common Eustachian vestibule (*Eu.*); the openings into the right and left tubes are 3 millim. apart. The opening of the tympanic cavity (*ty.c.*) is partly protected in front by a pair of distinct tympanic bones (*ty.*, *ty'.*), the size of these is very small. The entrance to the tympanic cavity is very large, but it is greatly overshadowed by the quadratum in front, and obliquely half-closed by the "tympanic wing" of the exoccipital (*t.eo.*) behind. That wing, which runs obliquely forwards, inwards, and downwards, has an *f*-shaped front edge, concave above, and rounded below; its back face, the outer edge of the *occipital plane*, is plano-convex. This wing is 10 millim. in extent, and the right and left wings are only 13 millim. apart along their inner edge. The whole breadth across the occipital plane, over the top of the tympanic wings, is 31 millim. Laterally these wing-like *outgrowths* enclose the hinder basi-cranial territory, which is margined with passages for the internal carotid arteries (*i.c.*), the vagus and glosso-pharyngeal nerves (X.), the hypoglossal nerves (XII.), and some small veins; all these passages are normal in *Steatornis*. The back of the quadrate is concave above, and then bulges backwards; thus the tympanic entrance is, at first, 3 millim., and then only 2 millim. wide.

Inside that narrow, oblique, high doorway there is the most confusing multiplicity of passages leading into the outer and inner chambers of the auditory labyrinth. The *middle ear* or tympanic cavity is as complex as in the Crocodile, but after a different fashion; whilst the inner ear or membranous labyrinth is enclosed in cavities, tubular and ventricose, very similar to those of the higher *modern* reptiles. Behind and between the crura of the otic process of the quadrate there is the opening into the "upper tympanic recess," and in front of that double condyle the Eustachian openings; and behind and more inwards there is a common vestibular opening leading to the *fenestra ovalis* and *f. rotunda*.

All these tympanic openings lie in the mouth of a trumpet-shaped cavity, formed by the wings of the basisphenoid above, and the

basitemporal plate below; this conical cavity is the "anterior tympanic recess."

All these parts of the ornithic auditory labyrinth are well seen in *Steatornis*.

The mandibles (Plate XVII. figs. 1 and 4) form a remarkable structure, being narrow and pointed in front, and extremely wide and bowed out at their hinder third. Behind, they curve inwards again, so that their "internal angular processes" are only 15 millim. apart, whilst the width across the broad part is 33 millim., the rami being 57 millim. long, and their ankylosed symphysis 5 millim. in extent, and their oblique hind edge 5 millim. high. Behind, in the coronoid region, near the hinder part of the dentary, and again at the fork of that bone, where there is a snag for muscular attachment, the bone is 7 millim. high. Under the first of these high tracts the outer face is hollow, but the hind part of each ramus is swollen and pneumatic, and there is a large foramen for the "siphonium," on the top of the "internal angular process." The sutures are nearly filled in; there is a large oblique dentary canal under the coronoid process. The hinder or articular part is wide and triangular; there is a deep sinuous hollow between the cartilaginous condyloid tracts, the outer of which is pyriform and convexo-angular, and looks forwards and inwards, 5 millim. long; whilst the inner condyloid face is a semicylindrical trough, with sharp sides; it looks more inwards than the outer condyloid facet; this scooped space is 2 millim. wide, 2·5 millim. long, and 1·5 millim. deep. The perforated internal angular process is blunt, turns upwards, and extends 2 millim. inwards from the condyloid trough. The motions of a jaw so hinged must have some peculiarity—there is so great an appearance of *art* in its convexities, concavities, sinuosities, and directions; the result of all this careful adaptive specialization would seem to be a perfect combination of elasticity and mobility with strength,—strength sufficient for the purposes of this frugivorous bird. Notwithstanding the large size of the socket, the eyeball, *like that of Opisthocomus*, is small; its largest diameter is 16 millim., and that of the sclerotal ring is 12 millim.; the largest plates are only 2 millim. wide, and there are 14 of them, as in *Gecinus viridis*; but in that bird they are much more elegantly formed, and 3·5 millim. wide; and they are neatly turned outwards at the inner edge of the rim; in *Steatornis* they are almost flat, just a little concave externally, and are very similar to those of a Monitor Lizard (*Psammosaurus griseus*). In another evening bird not much larger than *Steatornis*, namely, the Hooting Owl (*Strix aluco*), the eyeball is 25 millim. across, and the 1[illegible] sclerotals vary from 8 to 12 millim. in width outwards, and ar[illegible] about 6 millim. in extent at the outer rim, although much of this i[illegible] overlapped in most of them.

The *hyoid arch* (Plate XVIII. fig. 2) is normal, but rather feeble[illegible]. The tongue is short and sagittiform, and in it the cerato-hyals (*c.hy.*) converge and unite in front; they remain unossified; their length is 12 millim. The basal bar (*b.h.br.*) is of the same length; it is moderately dilated where the posterior cornua (*cornua majora, br*[illegible]

articulate with it, and the distal free end is narrow, terete; it is ossified, proximally, by a separate centre. The posterior cornua are 31 millim. long; they are feeble, rather straight, and the upper piece, which is 11 millim. long, has its distal half cartilaginous.

III. *The Vertebral Chain and Ribs.*

The vertebral formula of this bird is as follows:—C. 15, with 3 pairs of ribs, free, on the left, and 4 on the right side; D. 4; S. 13, the first with large free ribs, this and the next two, with arrested ribs, buttress the *pre-ilia*; the 13th vertebra not firmly ankylosed to the 12th; Cd. 7+4 or 5, =Total 43 or 44.

The *procœlous* articular facet of the *atlas* (Plate XIX. fig. 1, *at.*) is somewhat transverse, and this cup is largely *notched* for the odontoid process of the *axis* (Plate XVIII. fig. 3); not *perforated* as in most of the high arboreal birds. The atlas has no lateral passages for the vertebral artery; its *centrum* articulates with the *axis* by the normal *flat* facet. The odontoid process of the axis is large (Plate XVIII. fig. 4); this bone (Plate XIX. fig. 1, *ax.*) has thick, blunt upper and lower spines, and oblique ascending snags over the post-zygapophyses; a pair of small upper *fenestræ*, and, what is very rare in birds, well-formed *rib-bars* (*cr*^{2}.) to enclose the canal for the vertebral artery; the articulation of the centra throughout the rest of this region is *cylindroidal*. The 3rd cervical (Plate XIX. fig. 1) has also blunt upper and lower spines, lateral fenestræ, above, a wide top, and a definite snag over each post-zygapophysis, and a rudimentary rib, right and left, bounding the canal for the vertebral artery; this part is 3·5 millim. long.

The 4th cervical (Plate XIX. fig. 1) has its sides notched, not fenestrate; it has both upper and lower spines, somewhat larger riblets, and spines on the post-zygapophyses.

The 5th cervical is much like the next four or five; but in this *strong chain* of bones each succeeding vertebra is larger and stronger than the one in front of it; towards the chest they become shorter, as well as wider. This 5th bone, like the rest up to the 12th, has large riblets; on the 5th, 6th, and 7th these *styles* reach back within 2 millim. of the end of the centrum. None of these vertebræ have the inferior or carotid canal developed, for the inferior face is wide open and gently concave in front; at the middle they are subcarinate, and flat behind, where they broaden out into the apparently convex, but really concave, hinder facet. The wide canal for the vertebral artery, right and left, is only complete in the front third of each vertebra, and only on the 10th, 11th, and 12th is there any rudiment of the oblique bar (or flying buttress) so common in the Coccygomorphæ, a growth that partially finishes the lateral bony wall. I have mentioned that the 3rd has large lateral holes above, and that the 4th is notched, and not fenestrate. The 5th also is notched on its outer and upper edge; but the hinder margin of each notch is developed into an oblique, bony bar, which, running forwards, inwards, and upwards, forms by union with its fellow a

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small spine that looks forwards; this structure is seen, but not so well, in the 6th and 7th, and then dies out.

The 6th is the longest of the series; it is 13·3 millim. long, and 11 millim. wide, over the pre-zygapophysis. The 9th and 10th have oval knobs on their post-zygapophyses. The upper spine begins again on the 12th, on the 14th it is oblong and large like those of the dorsals, but smaller; in the 15th it is three fourths the size of those on the dorsals. The last six cervicals have a small inferior spine; this is trifid in the 14th, and is dilated into a broad plate in the last. The 13th has a small, free, V-shaped rib; in the 14th the *left* rib is very slender, but it is 22 millim. long, whilst its *right* rib is only 7 millim. long. On the *right* side the 12th has a V-shaped, distinct rib. The last cervical only differs from a dorsal in having no sternal piece; it has the uncinate process or bone (this is a distinct element), and is nearly as long in the 1st dorsal. The posterior part of this 15th vertebra is intermediate in character between cylindroidal and opisthocœlous. My memory fails me in endeavouring to think of any other existing bird *with more than three distinct ribs in the cervical region*, even on one side; there is often a want of symmetry in this part of the spine, as well as in other parts, *e. g.*, *atlas*, *sacrals*, &c. This fact—that, at least on one side, *four ribs* remain free in the lower part of the neck—coupled with what I shall now show as to the structure of the dorsal vertebræ, gives me the right to say that this is a very archaic or *quasi-reptilian* type.

The four dorsal vertebræ have very long and sharp upper spines, and the first two have, also, simple lower spines; the dilated plate seen in the last cervical has died out, and the process itself greatly elongated, downwards. The front face of the 1st dorsal centrum is cylindroidal, the rest of the articulations of the dorsals and the last dorsal with the 1st sacral is *opisthocœlous*. The centra are narrow, almost Chelonian in this respect, the 1st and 2nd are *mere keels*.

The posterior cup of each dorsal centrum is well excavated, and there is, right and left, at its upper part, a pair of semi-oval enlargements of this facet, that look like *an additional pair of zygapophyses*; hence, on the side view, the outline of the hollow end of each centrum is deeply notched at its upper third. Each of these *secondary facets* has its own concavity, so that each centrum fits to the one behind it by three hollow facets, one large, below, and two small, above; the articular cartilage is very thick in these vertebræ. Thus, although this mode of articulation is archaic, it is also intensely specialized by this modification (Plate XVIII. figs. 5, 6).

Up to the present, this is the only Cuculine type, *except the Psittacidæ*, in which I have found the dorsals to be opisthocœlous. It is common among Water[1] and Wading birds.

The *ribs* (Plate XIX. fig. 1) are very peculiar; they resemble those of the Hornbills, but the peculiarity seen in those birds is exaggerated in this. This is worth considering, as we have just

[1] The secondary facets just described are not so distinct in Parrots and Plovers as in *Steatornis*, which is equal to *Chionis* in this respect.

seen how Bucerine the palate is. This *isomorphism*, however, has to be taken for what it is worth; it is very limited, and in the great Cuculine group (Coccygomorphæ) we everywhere meet with characters in one Family that correspond in some degree with those in another, where everything else is very unlike. This is to be noted in the contrast seen between the dorsal vertebræ of the Bucerotidæ and those of *Steatornis*. In the former they are cylindroidal, and very broad, widened, and flat below; those of the latter run into a mere keel. Also, in the Bucerotidæ the spines in the dorsals form a feeble *saddle-backed* series, having a concave general outline; in *Steatornis* they form a strong straight series, and the interspaces between the spines are very small. In a New-World Kingfisher (*Ceryle alcyon*) the hinder dorsal centra make a great approach to those of *Steatornis*, without, however, being opisthocœlous.

The peculiarity just referred to in the ribs is their great breadth above, their narrowness below, and the low position of the uncinate processes (*p.u.*). The second pair are the widest; they are 6 millim. across for some distance below the tuberculum, and only 3 millim. near the lower condyle; the processus uncinatus is only 11·5 millim. at its base, above that, the condyle is 13 millim. long, and has an average breadth of 2·5 millim. The 1st sacral has a pair of ribs which have a sternal piece, imperfect, but 17 millim. long. The 1st dorsal sternal piece is 14 millim., the last 28 millim. long; they have an average width of 2 millim. The *sacral vertebræ* and the whole pelvis (Plate XIX. figs. 2, 3, and Plate XX. fig. 6) are very much like those of *Ceryle alcyon*,—the Kingfisher whose dorsals show a tendency to the opisthocœlous character, and have deep, concave-sided dorsal centra, with long, basally-dilated, inferior spines. As in that bird and the Hornbills the sacrum is completely ankylosed to the iliac bones, even in the young bird of the first year. This perfect union of the lateral with the median elements of the pelvis is seen in the Common Cuckoo (*Cuculus canorus*) in young birds of the first summer, but it is not seen in *Coccyzus* nor in *Saurothera*, even in old birds, so that this character must be a thing dependent upon conditions, being so variable in nearly related types. The most remarkable thing of all, however, is this, namely, that whilst these parts are completely ankylosed in the young Cuckoo, in the hinder half of the sacrum of an old bird the sutures are quite distinct. This is a phenomenon of the same nature as the re-segmentation in the adult of the last sacral of the young bird to increase the number of the free caudal vertebræ, a very common thing in the higher birds [1].

The first three sacrals are not yet ankylosed by their centra in the youngest specimen, and the 1st only is partly distinct in an

[1] I cannot leave this part of my description without remarking that this must be part of some general law with regard to the evolution of the higher kinds of birds. Intense ossification is the thing we are most familiar with in the osteology of birds, as compared with other Vertebrata. And yet the birds that are manifestly *most* archaic are often most intensely ossified: thus, to take a single fact, an archaic bird is often, not always, desmognathous, whilst a more specialized, newer, and nobler bird of the same family will be schizognathous.

adult bird. The 2nd and 3rd have strong fused riblets, 4 millim. long, and the whole vertebra is 15 millim. across. Here is a *sub-extinct* type with three pairs of buttresses, or, in other words, three pairs of dorso-lumbar vertebræ, covered by the *pre-ilia*; in *Chauna* there are *eight* such vertebræ.

The three next have only upper transverse processes (diapophyses); these, and those of the first three are all fused together above, and also to the ilia. Fenestræ appear behind; there are four pairs of these between the upper transverse processes of the last five vertebræ, all the rest of the roof is plastered over with thin bone—an ossified "aponeurosis."

The 7th sacral has a small pair of inferior bars or riblets, in my older specimens, but these are not visible in the younger; but they make very little difference to the general concavity, right and left of the fused centra; the 7th vertebra is the 1st *urosacral*. The 7th urosacral, or last general sacral, is the widest across its transverse processes, it is 30 millim. wide; the first of that series is only 13 millim. across. The 9th, 10th, and 11th sacrals are carinate, below, the 12th and 13th recover their width, and these are not quite ankylosed together, even in the older specimen.

The general concavity right and left of the ankylosed centra, which is filled by the emerging nerves and the lobes of the kidneys, is not closed in behind, as in many birds, by rib-like thickness of the post-ilia, and special enlargement of the transverse processes of one or more of the urosacrals.

Here we have the general open or unenclosed condition of the under surface, behind the "pre-iliac buttresses," that is seen in the Toucan and the Woodpecker, a somewhat common state of things in birds with a rather short, broad, and gently convex pelvis, such as many of the Coccygomorphæ possess. Unlike this state of things, we see in *Corythaix* and *Geococcyx*, as in the Raptores, a remarkable closing in of these concavities, by the special growth of post-ilia and the hinder urosacrals.

Behind their middle, the series of the seven *caudal vertebræ* (*cd.v.*) gradually shorten their transverse processes, which become wider as they shorten; the last free joint is 15 millim. across, the 1st is 29 millim., a little less than the width of the last sacral. A rudimentary chevron bone is seen on the 4th, and a large growth of this kind is present on the 5th, 6th, and 7th. The latter or compound bone is 24 millim. long, slender, and subfalcate, being arched somewhat on its sharp dorsal edge. The ventral edge is thick, but sharpens out behind, where the bone is somewhat lobate, and from 2·5 millim. becomes 3 millim. across in front; this bone is 7 millim. deep, it is evidently made up of 5 or 6 rudiments.

Towards the end of the caudal series the *procœlous* joint is established once more, and in the last of these articulations the *joint-cavity* is as complete as in the *occipito-atlantal* articulation; this is a common character in arboreal birds with a large and very mobile tail.

The sacral and caudal series both measure 48 millim. in length;

the 13th sacral is identified as such by its close union (ankylosis) with the postero-superior angles *of the post-ilia*; its centrum is distinct from that of the 12th.

Here, in this manifestly archaic bird we have, as in the Parrot tribe, a marvellous variety in the articulations and functions of the vertebral centra.

The *atlas* is procœlous, and its joint, behind, with the *axis*, is flat, with a joint-cavity. The joint-cavity, with a perforated *meniscus* and a *suspensory* ligament, is seen up to the sacrum; but the cervicals, only, are cylindroidal; the dorsals are opisthocœlous. Then the sacrals are ankylosed, and behind these come the caudals; which, in front, are subconcave on both faces, and are united by fibro-cartilage without a joint-cavity; whilst in the hinder part of the series that cavity reappears in a procœlous joint.

IV. *The Sternum and Shoulder-girdle.*

The *sternum* (Plate XVIII. figs. 7, 8) belongs to the same type as that of *Caprimulgus* on the one hand, and *Buceros* on the other, but is most like that of the latter. Like the *pelvis* it is short and broad, and it has only two notches; they are wide and rounded, and the xiphoids are all three finished behind by a large rounded plate of cartilage. The whole structure is light and rather feeble, and the bone is pneumatic. The coracoid grooves nearly meet; they form together little more than a right angle; between them there is a short, blunt, *inferior* rostrum (*r.st.*), scooped above and carinate below. Together, the *pre*-costal process (*pc.p.*) and the costal edge form a high, nearly equilateral triangle; there are four transverse condyles for the sternal ribs; the first of these only leaves a pre-costal tract 3·5 millim. in extent. The body of the bone is deep and the keel large, with its fore margin at a right angle with the body; in front, the keel projects a little at its lower third, where the lesser pectoral muscle ends behind; it ends 4 millim. in front of the ossified part, and about 13 millim. from the end of the middle metasternal cartilage (*middle xiphoid*). The whole structure, shoulder-girdle and sternum, is much like that of the Barn-Owl (*Strix flammea*), with its single notch right and left behind, the inner notches being nearly obsolete; that bird also has similar long scapulæ and coracoids, and the furcula are not unlike.

This peculiar isomorphism with the Owl is manifestly adaptive; I question if this bird is nearer akin to an *Owl* than it is to a *Cormorant*.

The structure of the sternum is in great contrast to that of the Common Goatsucker; in respect of its general *finish* it is more archaic. The comparative measurements are as follows:—

	Axial length. millim.	Breadth in front. millim.	Breadth behind. millim.	Length of keel. millim.	Depth of keel. millim.
Caprimulgus ..	27	16	25	32	12
Steatornis ..	58	43	52	45	18

The notches in *Steatornis* measure 9 millim. axially and 15

millim. transversely; the arrest of the keel, behind, is not seen in *Caprimulgus*.

The scapulæ of *Steatornis* (Plate XVIII. fig. 8, *sc.*) are 50 millim. long, 5 millim. broad at their widest part, and 3 millim. in the middle; they are elegantly xiphoid, and have a sharp decurved point. The coracoids (*cr.*) are also long; their length is 38 millim., the upper, or fifth, 8 millim.; at their largest (epicoracoid) angular expansion they are 15 millim. across, and only 3·5 millim. in the middle of the elegant and slightly sigmoid shaft; the *clavicular process* (root of precoracoid) is very small.

The furcula (*fr.*) is strong and U-shaped; in a straight line from the apex to their lower junction the rami measure 37 millim.; their average growth is 3 millim.: it is very uniform.

There is a small interclavicular knob (*i.cl.*), 2 millim. high, behind the junction of the rami.

The aborted "precoracoid" segment of cartilage has added very little to the apex of each ramus.

The curve of the rami (*cl.*) is great, and the roundness of the space where they meet below is perfect; it is a typical U-shaped furcula.

This is one of the most common forms of the furcula, not only in the great and varied group of the Coccygomorphæ, but also in Birds generally. Outside the Passerines, in the Arboreal groups, this form is very common, *e. g.* in Trochilidæ, Cypselidæ, and in *Podargus*, *Eurystomus*, and Bucerotidæ; whilst *Rhamphastos*, with its divided rami, and the Picidæ and most of the Alcedinidæ, have Passerine apices to their rami, that is they are dilated or bilobate.

V. *The Wing.*

The extreme slenderness of the bones forming the wing of *Steatornis* (Plate XX. fig. 1) is in great contrast with what we see in the Bucerotidæ, with their dilated and cellular bones.

The relative length, however, of the three *regions* is very similar in both, the *humerus* and the *manus* being both very short, the *cubitus* very long.

Thus, although this bird, like the Swifts and Humming-birds, has its wings *twice as large* as its legs, it is not a *Macrochire*; its *hand* is very small.

The following measurements of the region in several long-winged birds will make this plain; the *meaning* of these differences will be self-evident when the mode of flight of each type is considered:—

	Humerus. millim.	Ulna. millim.	Manus. millim.
Steatornis caripensis	72	106	82
Buceros ruficollis	102	147	85
Caprimulgus europæus ..	35	45	50
Cypselus apus	12	18	43
Strix flammea.....	80	88	75
Larus canus	92	102	102

It will be seen at once that the intensest specialization has occurred in the Swift, where the humerus is only two thirds the

length of the ulna, whilst the manus is more than three and a half times as long as the humerus.

In *Steatornis*, on the contrary, the humerus (*h.*) is seven eighths the length of the manus, whilst the former is only two thirds the length of the ulna, and the manus less than four fifths.

Caprimulgus is intermediate between these two extremes; its *wing-regions* increase in size in a regular manner (from above downwards); it is a sub-typical "Macrochire."

Buceros is the most remarkable in one respect; its manus is only four-sevenths the length of its ulna.

In the two good instances of birds with a light buoyant flight, the White Owl and the White Gull, the greater length of the ulna as compared with the humerus is similar in both birds; but the Gull has its ulna and manus of the same length, whereas in the Owl the latter is only six sevenths the length of the ulna or cubitus.

All these birds have to be considered separately in their various modifications, and no inference as to their *genesis* made rashly from some one or more similarities in their adapted structures.

I might have included *Podargus humeralis* amongst the birds whose wings were measured; but it gives me little help in seeking to find the affinities of *Steatornis*. *Podargus* appears to me to be more allied to *Eurystomus*; its sternum and pelvis differ greatly from those of this Neotropical bird, and its wings are more normal in the relative length of the three regions. Thus the humerus in *Podargus* is 74 millim. long, the ulna 88 millim., and the manus 68 millim.

The relations of *Podargus* must be sought for in the Australian Region and the Eastern Notogæa, generally; those of *Steatornis* in the Neotropical Region; whilst the true Goatsuckers, or Caprimulgidæ, must find their ancestors where they can. I cannot see my way to "father them" on either *Steatornis* or *Podargus*; yet both of these types may possibly be not unlike the birds that, during time, have been specialized into the true Goatsuckers.

I can only find a pneumatic foramen in the humerus (*h.*); that bone is quite normal; its upper crest for the insertion of the great pectoral muscle is large, and the dilatation below is hooked inwards, hollowed out and perforated to let in the air. The distal condyle is well developed, and there is above it, on the flexor side, a semi-oval hollow for the origin of the flexor muscles[1].

The long, slender, gently sigmoid radius (*r.*) and arcuate ulna (*u.*) are quite normal; the latter is marked very slightly for the secondary quills. The radiale and the ulnare are also well developed and perfectly normal; I see no "sesamoids" attached to them. The top of the manus has the large 2nd distal carpal (*d.c.*^{2}) over the large middle metacarpal, the lesser 3rd distal carpal (*d.c.*^{3}) on the outer side of the top, and the 1st distal carpal (Plate XX. fig. 2, *d.c.*^{1}) is seen as a knob looking towards the 1st metacarpal, but ankylosed to the 2nd.

[1] Mr. Frederic A. Lucas finds an "os humero-capsulare" in this bird (see Plate XX. fig. 1, *o.h.c.*).

The three metacarpals (*mt.c*^{1}, *mt.c*^{2}, *mt.c*^{3}) form together the usual main part of the manus; the interosseous space is large and uncovered above. The single phalanx of the 1st digit (*dg.*^{1}) has no rudiment of a second joint; the distal phalanx of the 2nd (*dg.*^{2}) has a small seed-shaped remnant of the ungual phalanx; the penultimate or 2nd phalanx of the 2nd digit is slightly longer and also narrower than the phalanx of the 1st digit. The single phalanx of the 3rd digit is the least of the three; it shows no signs of a second joint.

The oblong proximal phalanx of the 2nd digit has a slight perforation in its thin dilated distal part.

Above, returning to the head of the manus, I find a considerable thickening of the projecting shoulder of the 1st metacarpal. Also, on the extensor face of the 2nd metacarpal (close to the top of the interosseous space) there is an oval elevation 2 millim. long, due to the presence in the embryo of an intercalary metacarpal (*mt.c.*^{x}).

Also, on the flexor face of the 3rd metacarpal, above the interosseous space there is a similar but less-marked elevation, which is possibly due to a rudiment of the 4th digit; as a cartilage it is very constant in several families of birds in an early stage.

Large as these wings are, they nevertheless suggest the idea of *feebleness*; *they are like the bones of a bed-ridden person*, slender, smooth, and very light; is not this due to the extremely torpid habits of the bird, which only spends a very limited time in any active exercise? that exercise being simply eating. The extreme *fatness* of this bird favours this view of the case.

VI. *The Hip-girdle and Hind Limbs.*

A few measurements will show the special form of the pelvis in this type (Plate XIX. figs. 2, 3, and Plate XX. fig. 6); that part can now be studied as a whole—the hip-bones and sacrum together.

This pelvis may be compared with that of *Ceryle alcyon* and *Caprimulgus europæus*; it is most like that of the former, and has a rudiment of the peculiar spur seen on the side of the pre-ilium in Kingfishers; it is very wide.

In *Caprimulgus* and *Podargus* the pelvis is narrower.

	Length of pre-ilium.	Length of post-ilium.	Breadth across pre-ilium.	Breadth across trochanters.
	millim.	millim.	millim.	millim.
Ceryle	17·5	16·5	16	28·5
Caprimulgus ..	15·5	10·5	10	21·5
Steatornis	25	34	30	48

The width across the pubis, below the greatest interpubic breadth, is, in *Ceryle* 33 millim., in *Caprimulgus* 23 millim., and in *Steatornis* 53 millim.

One thing to be noticed is, that whilst in many Cuculines the "pre-pubic spike" is absent, *e.g.* in the Alcedinidæ and Caprimulgidæ

(*Caprimulgus* and *Chordeiles*), there is a rudiment in *Steatornis*, in *Cuculus canorus*, and in *Buceros ruficollis*; this part is nearly *as large in Geococcyx affinis* as in *Apteryx*.

In *Ceryle alcyon* the post-ilium sends backwards a process (its proper termination) over the ischium, which only measures 1·5 millim.; this spur is very long in *Steatornis*; it is 10 millim. in length; the ischium and pubis both project far backwards also as long ligulate processes, cartilaginous for their greater part. The pre-ilium (*pr.i.*) in *Steatornis* sends forwards a spike in front of the ear-shaped fore lobe of the bone; this is formed by the junction of the inner edge of the bone with the diapophysis of the underlying vertebra—the 1st sacral.

The "sacro-ischiadic" fenestra (*s.i.f.*) is oval; it is 8 millim. long by 4 millim. wide; its broad end is in front. The bony junction of the post-ilium (*pt.i.*) and ischium, behind this fenestra, is 1·5 millim. in extent.

The *ischium* (*isc.*) runs back quite free from the pubis (*pb.*); it keeps at a distance from it; its whole length is 38 millim., and its free projection, next below that of the post-ilium, is 13 millim. long; it is 6 millim. wide in front of the fore part.

The *pubis* is only 2 millim. wide in front and 3 millim. behind; its whole length is 47 millim., and the chord of the arc formed by this rib-like bone behind and the pre-ilium in front is 74 millim.

This is a peculiar form of pelvis, so broad, gently convex, and free from all strong outgrowths; it is only in birds whose hind limbs are small and feeble, such as Cypselidæ, Trochilidæ, Alcedinidæ, and the like, that such a pelvis is possible. Even among the Cuculines, whenever the legs are strong, we get a great contrast to this, *e.g.* the Musiphagidæ, and such Cuculidæ as *Saurothera* and *Geococcyx*.

The *Hind Limbs* (Plate XIX. figs. 4, 5) of *Steatornis* are, as I have said, only half as large as the wings; I here compare them, in the measurement of the main regions, with those of the Kingfisher and Goatsucker:—

	Femur.	Tibia.	Tarso-metatarsus.	3rd digit.
	millim.	millim.	millim.	millim.
Ceryle alcyon	29	39	12·5	24
Caprimulgus europæus	21·5	29	14	20
Steatornis caripensis..	38	48	17·5	37

Here we see that, roughly speaking, the femur (*f.*) is three fourths the length of the tibia (*t.*) in *Ceryle* and *Steatornis*, and a little more than two thirds in *Caprimulgus*.

The tarso-metatarsus (*t.mt.*) is little more than half the length of the 3rd digit in *Ceryle*, more than two thirds in *Caprimulgus*, and considerably less than half in *Steatornis*.

The relative size of the bones of the leg and foot, on the whole, in the last of these birds is very similar to what we find in the Cypselidæ, Caprimulgidæ, and Alcedinidæ; for in all these families the hind limb is very feebly developed. This is very marked also in

Steatornis; and the shape and strength of its leg-bones are in great contrast to what we see in such Fowl-like Coccygomorphæ as the Musophagidæ and the Ground-Cuckoos.

The *femur* (*f.*) of *Steatornis* is, perhaps, the straightest to be seen in the Class; the breadth is 8·3 millim. above and below, and it narrows to a diameter of 3·5 millim. in the middle of its shaft. The condyloid ledge for the feeble *fibula* (*fb.*) is not well-marked; that bone is a little above half the length of the *tibia*, which latter bone is as straight and *primordial* as the femur; it would seem as if these bones had not altered *in shape* since the middle of incubation. The breadth of the head of the tibia (*t.*) is 9 millim., across its tarsal base 8 millim., whilst the middle of the shaft is only 3 millim.

The *cnemial ridges* are very rudimentary, and the ridge outside for the fibula (*fb.*) only reaches 15 millim. downwards.

A thin delicate tendon-bridge exists in front of the base of the tibia below (Plate XX. fig. 4); but there is no special depression between the astragalar and calcaneal regions of the condyle, for the intercondyloid knob on the distal tarsal (or head of the shank) is nearly obsolete (Plate XX. fig. 3). The inner part of the condyle is formed by the astragalus, and the outer by the os calcis; there is a rudiment of the intermedium between them; the *centrale*, or "naviculare" (*nv.*), is seen as a cartilaginous, curved wedge behind the joint. The tarsal outgrowth behind the head of the shank to form a tendon-canal for the *plantar tendons* (Plate XX. figs. 3, 5) is open. This part is closed in, and forms one canal in *Ceryle alcyon*; in the Martin (*Chelidon urbica*), as in *all* the Coracomorphæ, there are *five* canals in the compound mass; in the Swift (*Cypselus apus*) there is an unusual thing—a little bridge in front of the distal tarsal; but the two ridges *behind* are not united[1].

There is a notable peculiarity in the structure of the *inter-tarsal* joint. The condyloid trochlea formed by the astragalus is large and perfect, and rolls in a well-formed concavity on the inner side of the great distal tarsal. But the calcaneal part of the double trochlea is feeble (Plate XX. figs. 3–5) and the outer part of the facet on the lower tarsal is almost flat[2].

The tarso-metatarsus shows the signs of division into three main metatarsals, both above and below, 2nd to 4th (Plate XIX. figs. 4, 5). The free distal piece that carries the "hallux" (*mt.t'.*) is 5·5 millim. long.

On the outer side of the head of this small shank the 5th *metatarsal* (*mt.t.* 5) can be seen as a club-shaped rudiment, fused with

[1] The classification of birds by the palate is very useful as a *help* to other methods, everything else being taken into account. Nowhere does it show its value more than in the Coracomorphæ; they are all "Ægithognathous"; but the Ægithognathæ and the Coracomorphæ are not equal groups—the former is too large for accurate superposition on the latter; the Swifts (Cypselidæ) are Ægithognathæ, but they are not Coracomorphæ.

[2] This obliquity reminds one of that in the free astragalus itself in the Megatherium, as compared with the same bone in the Horse, the latter having the condyle in two nearly equal, oblique semicircular elevations, whilst in the former the two convexities are extremely unequal.

the distal tarsal over the 4th metatarsal; it is 1 millim. across, and runs downwards 2·5 millim. The whole tarso-metatarsus is less than half the length of the femur and little more than one third the length of the tibia. It is much like the same part in the "Ornithoscelida," except for the fusion of its elements. The breadth, below, across the condyles for the four digits is 11 millim. nearly, two thirds as much as its whole length, namely 17·5 millim. The condyle for the 1st is 4 millim. higher up than that for the 3rd digit. The whole series of metatarsals in the distal part of the shank are curiously twisted backwards, from without inwards, so that all the condyles lie nearly on the same oblique plane; this is a very *Cypseline* state of things. The breadth, above, of the small tarso-metatarsal is 6·5 millim., in the middle 4 millim. The condyles are all grooved, the groove is deepest on that for the 3rd digit.

The length of the digits (Plate XIX. figs. 4, 5, *dg.* 1–4) is as follows:—1st, 17 millim.; 2nd, 30 millim.; 3rd, 36 millim.; and 4th, 33 millim. The proximal phalanges increase in length and thickness, gently but sensibly, from without inwards, in a very regular manner. The proximal phalanx is shorter than the penultimate in the 3rd and 4th digits; the two are equal in the 2nd; in the 4th the 2nd and 3rd phalanges are not so long *together* as the 4th or penultimate; this is a rare structure. The claw-joints are strong and well-curved.

VII. *Summary.*

The Guacharo (*Steatornis*) is not the only Neotropical type that asks to be put into a separate suborder, such as that which Professor Huxley (Proc. Zool. Soc. 1868, p. 311) has constituted for the Hoatzin (*Opisthocomus cristatus*).

If it were allowable, the term "Heteromorphæ" should be kept for all those birds that cannot be classified: that refuse to be put into any of our normal groups. We should then have a "Cave of Adullam" for all those waifs and strays from the old Avifauna; birds that, like the Flamingo, the Palamedea, and the types just mentioned, cannot be bound up with the other bundles, because the cords that keep the normal birds into such a neat ornithological order will not tie when bound round these abnormal forms, even if carried round them *nine times*!

When, as in *Steatornis*, only one species is still living of an evidently isolated type, the inference is at once made that here, if anywhere, we have an Archaic kind of bird. I think that I have made it clear in the foregoing description that this is really the case in this instance.

There is one difficulty in this kind of research, namely, that in those types that are evidently Archaic, we meet with *some* characters that are seen at once to be the result of the very last or newest specialization that this type of skeleton has undergone.

Of course *Steatornis* has had *as much time* to do this in as any other bird; but, whilst belonging to a *conservative* and almost *extinct* family—extinct but for it, the Oil-bird has some characters that

are only present in birds that have arrived at the highest state of ornithic modification and perfection.

In the self-same skull we have then, as I have shown, a basis cranii with large backwardly placed "basi-pterygoids" that are nearly Struthious; the only carinate bird that is a rival to *Steatornis* in this respect is Pallas's Sand-Grouse (*Syrrhaptes paradoxus*) (see Trans. Zool. Soc. vol. v. pl. xxxvi.).

On the other hand, the "ethmo-nasal wall" has been completely broken through and thus a complete hinge of the face on the skull has been formed exactly as in the Parrots, where the mobility of the upper face is at its greatest possible perfection. But the basis cranii of the Parrots, in harmony with the "palato-quadrate" arcade, is in the highest state of modification; no bird is so far from the old *quasi-reptilian* Ratitæ in this respect as the Parrot.

Yet, as a set-off against this, whilst the Archaic Ratitæ have all their pre-sacral vertebræ in the highest ornithic perfection, namely, *cylindroidal*, in the Parrots the dorsals are opisthocœlian; so they are as we have seen in *Steatornis*, which also has the rare condition, as in *Hesperornis* and the Grebes, of perfect rib-bars on the axis [1].

In Wading and Water Birds this state of things is common, *e.g.* in the Penguins, *Alcinæ* Divers [2], Gulls, and *Limicolæ*; but the Psittacidæ and *Steatornis* are the only high-class arboreal birds in which I have found this character of opisthocœlous dorsals.

Here I may remark upon a most puzzling fact with regard to both old and new kinds of birds, namely, a *prolepsis*, or anticipation, so to speak, of Mammalian characters, in certain birds—a similarity or isomorphism rather, for here "genetic affinity" has no place.

The more Archaic the type of any one of the existing Ratitæ, the more complex is the *nasal labyrinth*, quite similar in its complex "outgrowths" to what we see in a mammal. The very dorsal vertebræ that are *ancient* or opisthocœlian in a Parrot, are also like the vertebræ of a Mammal—they have *thin terminal epiphyses*.

In by far the noblest of all birds, the Crows and Songsters, the form of palate which gives them their *morphological name*, "Ægithognathæ," is quite similar to what is seen in the Marsupials and low Insectivorous Mammals.

In this very bird, *Steatornis*—as in *Podargus*, the larger Bucerotidæ, and in certain Ducks and Swans—there is a degree of *double Desmognathism* quite similar to that which exists in the Marsupialia.

Hence we had better, at present, speak of these things as cases of *isomorphism*, or similarity—confessing our ignorance of their meaning—than rashly to set them down to genetic relationship.

By taking this character or that, and closing the eyes to the other characters seen in *Steatornis*, we might find many a relation for it: it is, nevertheless, a friendless bird, I cannot find a near relation for it. And this is the more evident if we consider that the forms that apparently come nearest to it are Eastern and Australian types,

[1] In typical Chenomorphæ—Geese, Swan, Ducks—the *atlas*, also, has its rib-bar complete, and a separately ossified rib.

[2] Not in the Loons and Grebes.

such as *Eurystomus* and *Podargus*; not the inhabitants of its own region.

The same thing is to be seen in several other types: *Dicholophus*, a Crane-like bird of prey, represents the Ethiopian Secretary-bird; the Boatbill (*Cancroma*), the great Balæniceps of the Soudan; and even the Tinamous, which are so closely related to the Ratitæ, look more towards *Apteryx* than towards *Rhea*. These, however, are a few facts which are mere samples of a very large number, and the organic types generally that lie beyond "Wallace's Line" in the East, are to be compared with those that are from beyond the Isthmus of Panama in the West.

As to the group to which *Steatornis* belongs, I think that at present the best thing to do is to drop some of Professor Huxley's smaller group-terms, and to retain these for larger gatherings of birds.

If his "Cypselomorphæ," for instance, are allowed to fall back into the great and most important group of the Coccygomorphæ we shall get over many difficulties and have a suborder comparable to the Coracomorphæ.

These two groups, so constituted as to take in, in the latter, all the Ægithognathæ except the Swifts, and the former be made to hold within one ideal boundary-line all the non-passerine arboreal "Altrices" (except the *Pigeons* and *Raptorial birds*), all the "Tenuirostres," "Fissirostres," "Syndactyli," and "Zygodactyli" of Cuvier,—then the likeness or the unlikeness of the two groups will shine out clearly.

In the Coracomorphæ we have 6000 species, that, by their most amazing uniformity, suggest to the Evolutionist one common parentage, and in that group only a small percentage of types is abnormal. In some characters, both of the skeleton and of the soft parts, there is an absolute uniformity. I know of no case in which the cæca coli are absent; and from the Corvidæ proper to the Pteroptochidæ, the *most variable part of the skeleton*—the *manus* and *pes*—the distal part of both fore and hind limbs, are uniform throughout. The carpo-metacarpus has, in every skeleton I have seen, a bony bridge *over* the proximal part of the interosseous space formed by ankylosis of an ossified cartilaginous plate, which is in reality an *intercalary metacarpal*. Also in none, except the Bank-Swallow, have I found a developed *ungual phalanx* to the 1st or 2nd digits; they almost always abort or suppress the 2nd phalanx of the 1st, and the 3rd phalanx of the 2nd digit.

In the leg, the tarso-metatarsus always, so far as I have seen, has *five* tendon-canals behind its head. There is no finished canal here either in *Steatornis* or in *Cypselus*; in the Common Fowl there is one passage—a common state of things.

Then, as I have said, in the skull there is always that peculiar modification of the Schizognathous palate which Professor Huxley calls the Ægithognathous type.

Also, except in rare cases, the basipterygoids are *nearly suppressed*; only in a few cases are they seen even as thin prickles, in

the adult. In all cases that I have examined there is, in all young birds, a large remnant of the *old larval* palato-quadrate cartilage, the cartilaginous post-palatine; this is a correlate of the Ægithognathous fore palate, and is seen in Swifts.

Only in a few, just the small family of the Pteroptochidæ, has the sternum *four* notches on *one side*; I long ago saw an additional notch in the Blue-tit (*Parus cæruleus*) ('Shoulder-girdle and Sternum,' pl. xvi. fig. 1).

The "interclavicle" is marvellously uniform in the Passerines; it nearly dies out in some few Australian forms.

The *range of size* is considerable, from the Raven to the Nectar-bird, but far less than in the Coccygomorphæ, if the Humming-birds are taken into that group.

These are a few of the things that show themselves, either throughout, or nearly throughout, the Coracomorphæ. These birds do break down as to their *syrinx*; both in the Eastern and in the Western *Notogæa* there are forms that fail to be true Oscines. But these *Tracheophonous* and *Haploophonous* types form a very small percentage of the whole.

Such a *syrinx* as is seen in the vast majority of this huge assemblage of birds is seen *nowhere else*; no other bird has an equally *complex* and *perfect* second larynx; the Parrots come nearest to them in this respect; and outside the Passerines the Parrots are the highest and most specialized of all existing birds.

Now if we survey the Coccygomorphæ after the "Cypselomorphæ," "Celeomorphæ," and "Psittacomorphæ" have been taken in, we shall, indeed, find a contrast in these two great suborders.

In the first place this "mixed multitude" only contains about a fourth of the number of the uniform Passerines; but they are *ten times* as polymorphic.

Taking the characters just mentioned in the Coracomorphæ in order, we find that the *cæca coli* are extremely variable; in the Ægithognathous Swifts they are suppressed, also in the Rhamphastidæ and Picidæ; sometimes they are large, as in the Cuckoo and Goatsucker.

The *manus* shows the *interosseous bridge* perfect, and completely ankylosed with the 2nd and 3rd digit in *Picus*, *Rhamphastos*, and *Alcedo*; in the Swift it is gone, in the Trochilidæ it is half as large as in the Passerines, and free on its outer edge.

The *pes* does not show, in any case that I know of, the *five* tendon-canals; there is a single canal, as a rule, and this may be open behind,—only covered with membrane.

The *palate* in this group, instead of being uniform, shows *six* different modifications, namely:—

1. Ægithognathous—Cypselidæ.
2. Saurognathous—Picidæ.
3. Schizognathous—Trochilidæ, Trogonidæ, Caprimulgidæ (part).
4. Indirectly Desmognathous—Coliidæ.

5. Directly Desmognathous—In the majority of Families.
6. Doubly Desmognathous—*Podargus*, *Steatornis*, Bucerotidæ (part).

Of course the first three are *varieties* of the Schizognathous type, as the last three are of the Desmognathous.

The basipterygoids vary from complete abortion in the adult, almost total suppression (in the Swift), to a very high state of development, almost Struthious, in *Steatornis*. They are large and far forwards in the Trochilidæ, and large in the middle region in the Trogonidæ.

The *endoskeletal* post-palatine rudiment is just dying out in the Caprimulgidæ, and it is in *Caprimulgus europæus* that I have found the greatest approach to *Ægithognathism*; the large vomer is formed from a pair of centres, but it is only united to the nasal floor by ligament; in the Swift the Ægithognathism and the post-palatines are seen.

The sternum takes on almost every possible modification in the Coccygomorphæ; it may have an entire hind margin, as in the Trochilidæ and Cypselidæ, or one or two pairs of notches.

The interclavicle is almost as large as in the average Passerines, or even in the Gallinaceæ, in *Piaya cayana*, *Geococcyx affinis*, *Coccyzus americanus*, and *Cuculus canorus*; it is present but small in *Saurothera vieilloti*; all these are true Cuculidæ.

In the Picidæ and Alcedinidæ and others the interclavicle is suppressed; in the Toucan, some of the Hornbills (*e. g. B. albirostris*), and in *Corythaix* the rami do not unite; they do in many of the Psittacidæ, but the *top*, only, of each "ramus" remains in some forms; the top of the ramus is double, as in the Passerines, in *Picus*, *Rhamphastos*, and *Alcedo*.

The *syrinx* is extremely variable in this group, from its lowest form in the Swift to a very high, but not the highest, in the Parrot. In some of the Cuculidæ the trachea is double a long way up, quite like what is found in the Chelonia (see Beddard, P. Z. S. 1885, pp. 168–187).

Nevertheless all these varying forms are, in some unknown way, related, and related most intimately. You cannot cut up the group without violence; at their *upper margin* they interdigitate with the great Passerine suborder; any supposed near relationship of the Coccygomorphæ to any other type is, I believe, an illusion; they show in some cases a resemblance to the Owls, and in others, as in the Musophagidæ, to that most abortive and aberrant Curassow, the Hoatzin (*Opisthocomus*); but I feel certain that in these cases there is no true *genetic affinity*, it is merely *adaptational isomorphism*; or, in plain English, similar modification, in different types of birds, to the same kind of life.

The peculiarities of structure in *Steatornis* that are of most interest are those that are shared by it with ancient and extinct Reptilian types. Of course I do not forget that the whole of its organism is in a certain sense *Reptilian*; but although the bird grows up from

an essentially Reptilian "root," yet the various parts are marvellously transformed, and the bird itself has gained a far higher structural and physiological level than that of even the highest and most modern Reptile.

Here, however, in *Steatornis*, we find the ancient structures built up within the modern; it is not a perfectly typical bird, but is *composite*, so to speak, a type made of things new and old.

The Singing-birds, including, of course, the large Crows, have, more than any other birds, put away the old leaven of the low Reptilian nature that they started with; yet in them, as I have shown, the *old materials* are sometimes built up into, but hidden by, the transformed, newer parts.

But here, in this bird, the hinder part of the pre-sacral chain of vertebræ has its articulations of the opisthocœlian kind, as in Archaic Reptiles. Its palate, also, has just the same degree of Desmognathism as the Green Turtle (*Chelone viridis*); and it has more *free* cervical ribs than any other known bird.

Its tarso-metatarsus is but that of an Ornithoscelidan Reptile, just masked by ankylosis of certain parts; it is in an arrested condition as compared with that of any Passerine bird.

All birds living, both Ratitæ and Carinatæ, come nearer the Amphibia than any kind of existing Reptiles in the foundations of the cranial superstructures; the "parasphenoid" is very large and Ichthyopsidian in all these supra-reptilian types.

But the Oil-bird, like a few more of the Carinatæ,—Musophagidæ, Procellariidæ, &c.,—has in its fore palate the triradiate remnant of the fore part of the Amphibian palato-quadrate; it clearly shows, in the adult, the "ethmo-," "pre-," and "post-palatine" bars.

The conclusion to be drawn from facts of this kind is, surely, not that Birds are to be imagined as arising from the Reptiles, proper—the cold-blooded "Amniota"—either by the utilization of sudden "sports," or by a slow, secular adaptation of Reptilian structures to the necessities of a flying creature, this flying creature becoming hot-blooded, quick-tempered, intelligent, vocal, and loving.

Rather, it seems to me, to point out that the origin of the Bird must be sought for, by the "scientific imagination," among low and quasi-larval forms, similar to those with which we are acquainted in the larvæ of existing Amphibia and Fishes, and similar to, *and near relations of*, other low Chordata, that gave rise to the Reptiles.

The low and simple types from which we may suppose the Mammalia to have arisen could not have been so nearly related as those from which, *by the mystery of transformation*, the Reptiles and Birds had their origin.

Although hot-blooded, the lowest kind of Mammals—the Monotremes—are in some parts of their organization on a level with such Archaic Reptiles as the *Ichthyosaurus* (for example in their shoulder-girdle); yet in the formation of their *mouth* and *middle-ear* they are quite unlike both Reptiles and Birds; and show in a

rough and unfinished form the same morphology of these parts as is found in our own Skull.

EXPLANATION OF THE PLATES.

List of Abbreviations.

The Roman numerals stand for nerves or nerve-foramina.

ac. Acetabulum.
ag. Angulare.
al.e. Aliethmoid.
al.n. Alinasal.
al.s. Alisphenoid.
al.sp. Aliseptal.
ar. Articulare.
at. Atlas.
a.t.r. Anterior tympanic recess.
ax. Axis.
b.hy. Basihyal.
b.h.br. Basi-hyobranchial.
b.o. Basioccipital.
b.pg. Basipterygoid.
br. i. 1st branchials (cornua majora).
b.s. Basisphenoid.
b.t. Basitemporal.
c. Centrale and centrum.
cd.v. Caudal vertebra.
c.f.c. Cranio-facial cleft or hinge.
c.hy. Cerato-hyal.
cl. Clavicle.
cr. Coracoid.
c.v. Cervical vertebra.
c.v.a. Canal for vertebral artery.
d. Dentary.
d.c. Distal carpal.
dg. Digit.
d.v. Dorsal vertebra.
e.eth. Ectoethmoid.
e.n. External nostril.
e.o. Exoccipital.
Eu. Eustachian opening.
f. Femur.
fb. Fibula.
fbe. Fibulare.
f.m. Foramen magnum.
fr. Furcula.
h. Humerus.
i.c. Internal carotid artery.
i.cl. Interclavicle.
il. Ilium.
i.m. Intermedium.
i.o.f. Interorbital fenestra.
i.r. Intermedio-radiale.
isc. Ischium.
j. Jugal.
l. Lacrymal.
lc. Lacrymal canal.
mc.c. Metacarpus.
m.st. Metasternum.
mt.t. Metatarsus.
mx.p. Maxillo-palatine.
n. Nasal.
n.px. Nasal process of premaxillary.
n.s. Neural spine.
nv. Naviculare.
ob.f. Obturator foramen or fenestra.
oc.c. Occipital condyle.
od.p. Odontoid process.
o.h.c. Os humero-capsulare.
o.s. Obturator space.
o.u. Os uncinatum.
p. Parietal.
pa. Palatine.
pa.s. Parasphenoid.
pb. Pubis.
p.e. Perpendicular ethmoid.
pg. Pterygoid.
p.p. Pars plana.
pr.i. Pre-ilium.
pt.i. Post-ilium.
pr.z. Pre-zygapophysis.
p.s. Presphenoid.
pt.z. Post-zygapophysis.
p.u. Processus uncinatus.
q. Quadratum.
q.j. Quadrato-jugal.
rd. Radiale.
r. Radius.
r.b.s. Rostrum of basisphenoid.
s.ag. Supra-angulare.
sc. Scapula.
s.i.f. Sacro-ischiadic fenestra.
so. Supra-occipital.
sp. Splenial.
sq. Squamosal.
s.r. Sacral rib.
st. Sternum.
st.r. Sternal rib.
s.v. Sacral vertebræ.
t. Tibia.
t.c. Tendon-canal.
t.eo. Tympanic wing of exoccipital.
t.f. Temporal fossa.
t.mt. Tarso-metatarsus.
ty. Tympanic.
ty.c. Tympanic cavity.
u. Ulna.
ul. Ulnare.
v. Vomer.
vb. Vestibule.

So far as is known at present there are four well-marked species of Otter occurring in the Oriental Region, and these may be briefly distinguished as follows:—

A. Muzzle naked. Claws large. Internal lobe of p_4 small. ("*L. vulgaris*."[1])

B. Muzzle naked. Claws large. Internal lobe of p_4 large. ("*L. ellioti*.")

C. Muzzle hairy. Claws large. Lobe of p_4 small. ("*L. sumatrana*.")

D. Muzzle naked. Claws rudimentary. Size much smaller than in A, B, and C. ("*L. leptonyx*.")

The synonymy of A is happily quite clear, thanks to the labours of Messrs. Anderson and Blanford. It stands as *Lutra vulgaris*, from which I agree with Mr. Blanford in thinking that *L. nair*, F. Cuv., and *L. indica*, Gray, are not separable. To its Indian synonyms should also now be definitely added *L. chinensis*, Gray, and, as stated below, *L. aurobrunnea*, Hodgs., and *L. nepalensis*, Gray.

The history of B is much more difficult. Firstly, it is unquestionably the true "Simung" of Raffles, as evidenced by Raffles's own specimen now in the Museum. The "Barang" of the same author is really species C; but F. Cuvier, when describing a young specimen of B, still in the Paris Museum, mistook it for the Barang, and therefore called it "*Lutra barang*," a name which must stand as the first binomial applied to the species. This species B is therefore *L. barang* of the continental naturalists, Lesson, Fischer, and others, who followed Cuvier, but not the *L. barang* of English authors, although it should now become so. At the same time it is the *L. simung* of Lesson, Horsfield, Gray, and others. Later on, specimens of the same species received the names of *L. monticola* from Hodgson, *L. ellioti* from Anderson, a name under which Mr. Blanford has placed the species, and *L. macrodus* from Gray (see below).

The range of *L. barang* extends over the whole Indian Region from the Indus to Ceylon, and from Nepal to Sumatra. Its occurrence in Java has never been confirmed, and F. Cuvier was very possibly mistaken as to the exact locality of the type; indeed, Lesson in 1827 speaks of the species as having been discovered by Diard and Duvaucel in *Sumatra*, as though an error in the locality had been discovered in the interval.

Species C, the Hairy-nosed Otter of the Malayan part of the region, is the true "Barang" of Raffles, that author's type having come into the British Museum from the collection of the late Dr. Crisp, and is therefore the *L. barang* of Cantor, Gray, and others, who followed Raffles's determination. In 1865 Dr. Gray elevated the Indian Hairy-nosed Otters to the rank of a genus, and called the

[1] The names in brackets are those used in Blanford's work (Faun. Brit. Ind., Mamm. pp. 182–187, 1888), the most recent on the subject.

present species *Barangia sumatrana*, from the original locality of Raffles's specimen, and thus making the latter individual the type of the species. This "*Barangia sumatrana*" being, as Dr. Anderson has pointed out, the first unused binomial name applied to the species, it must stand as "*L. sumatrana*, Gray"[1].

Lastly, for species D, the little clawless Otter, a different name to the well-known "*L. leptonyx*" most unfortunately has the priority. In the 'Verhandelingen van het Bataviaasch Genootschap' for 1780[2] Baron F. v. Wurmb gave a description of an Otter found near Batavia which he called the "Grijze Otter," and to this "Grey Otter" Illiger in 1811 applied the name of *Lutra cinerea*"[3]. This name has never been referred to except incidentally among the synonyms of *Lutra leptonyx*, and even then it is usually without any particulars as to date or place of publication.

The reference of *L. cinerea* to *L. leptonyx* is unfortunately correct without a shadow of doubt, since in his accounts of the "Grijze Otter," Baron v. Wurmb mentions among other things that it has "ronde nagels" and is only 1 foot 6 inches long, with a tail 1 foot in length, two characters that connect it with *L. leptonyx* alone of all Otters. Again, Horsfield in his original account of *L. leptonyx*[4] himself quotes v. Wurmb's "Grijze Otter" as a synonym, without knowing that 14 years before a Latin name, *L. cinerea*, had been applied to it, which name antedated then and must, I am afraid, supersede now the better-known "*L. leptonyx*." That the "Grijze Otter" is the same as *L. leptonyx* is also proved by the fact that no other species of the genus is as yet known to inhabit Java, unless the very different sharp-clawed *L. barang* should after all be found to occur there.

Of the names now looked upon as synonyms of one or other of the above four species, the following require some explanation:—

(1) *Lutra aurobrunnea*, Hodgs. J. A. S. B. viii. p. 320 (1839).

(2) *Barangia* (?) *nepalensis*, Gray, P. Z. S. 1865, p. 124; Cat. Carn. B. M. p. 101 (1869).

The type of the first of these descriptions is a distorted and dyed skin, and that of the second an incomplete skull. Both were presented to the Museum by Mr. B. H. Hodgson along with his Nepalese collection, and, as suggested both by Anderson and Blanford, perhaps belong to the same individual.

The skin (*L. aurobrunnea*, Hodgs.) is, I feel sure, that of an example of *L. vulgaris*, as is shown, in spite of its distorted muzzle, by the sharply-defined limit of the hair growing below the nostrils, where in hairy-nosed Otters (to which the species has been said to be allied) there is no such exact limit. The feet, again, so far as it

[1] It may be noted here that *Lutra palæindica*, Falc. and Cautl., from the Siwaliks of N. India, proves, on a direct comparison of the type, to be almost indistinguishable from *L. sumatrana*.

[2] Vol. ii. p. 285 of the 3rd edition, published 1826.

[3] Abh. Ak. Berl. 1811, p. 99 (published 1815).

[4] Zool. Researches in Java, 1824.

is possible to make out anything from them, are far more like those of *L. vulgaris* than *L. sumatrana*. Independently, therefore, of the skull, I should place "*L. aurobrunnea*" as a synonym of *L. vulgaris*.

The skull ("*L. nepalensis*") presents an interesting example of the difficulty of making out the species of Otter from cranial characters alone, for while both Gray and Blanford have looked upon it as showing close affinities to the hairy-nosed *L. sumatrana*, I am convinced, on the other hand, that it is only the skull of a female *Lutra vulgaris*, more or less degenerated by living in captivity.

Thus it shows unequivocal traces of confinement in the peculiarly roughened and more or less diseased character of the bone, especially round the bases of the canines. Now the only differences that I can find between this skull and that of an undoubted *L. vulgaris* (♀) lie in its rather smaller size and a general weakness in dentition, both easily explainable on the theory of the animal having been brought up in captivity.

Should this view be correct, the species (No. 94 of Mr. Blanford's work) must be altogether expunged from the list of the Mammals of British India, as both *L. aurobrunnea* and *L. nepalensis* will come under *L. vulgaris* (No. 92). Nor can its place be taken by the true hairy-nosed Otter, *L. sumatrana*, which, so far as is yet known, does not occur north of Malacca.

The individual identity of the skull of "*L. nepalensis*" and the skin of "*L. aurobrunnea*" is rendered at the same time both more probable and less important by the independent reference of each to *L. vulgaris*. It may also just be noted that the skin is clearly that of a female.

(3) *Lutra macrodus*, Gray, P. Z. S. 1865, p. 128; Cat. Carn. B. M. p. 105 (1869).

This Otter, described by Dr. Gray from two fine skins said to have come from Brazil, has long been a puzzle to workers on American Mustelidæ. The skull proves that it is entirely distinct from any previously known Brazilian Otter, and I should unhesitatingly recognize it as a valid species, were it not that no difference whatever can be found, either external or cranial, between it and the Indian *Lutra barang* (species B above). As to the locality of the types, Dr. Gray expressly states that "M. Parzudaki assured me that he had received the pair direct from Brazil, from a collector who shot them;" but in spite of this assurance I am inclined to believe that some change of specimens or other mistake occurred, and that they really came from the Indian Region. Other Brazilian specimens since received and referred by Dr. Gray to *L. macrodus* prove, on an examination of their skulls, to be really quite different from it, so that the locality for the originals has never been confirmed. Considering, therefore, these facts, I look upon "*L. macrodus*" as a synonym of *L. barang*, at least until any such Otter is found in South America—a contingency that would-be describers of new species of Neotropical Otters should be prepared for.

(4) *Lutra swinhoei*, Gray, P. Z. S. 1867, p. 182; Cat. Carn. B. M. p. 105 (1869).

This species was founded by Dr. Gray on a fragmentary skull sent by Mr. Robert Swinhoe from China. The locality was originally given as Formosa, but Mr. Swinhoe afterwards stated[1] that the Otter was obtained at Gawkang Island, near Amoy, and gave, at the same time, some observations on its habits.

The typical skull, as suggested by Dr. Anderson, proves, on comparison, to be referable to *L. cinerea*, which, alone of all Otters, is, as Dr. Gray says of this skull, "characterized by the small size of the upper cutting-teeth, the series forming only a width of 4½ lines; while the series of most other Indian Otters occupy 6 lines, or sometimes more."

The following synonymy shows in tabular form the results arrived at in the preceding paragraphs:—

A. Lutra vulgaris, Erxl.

Syn. *Mustela lutra*, Linn. (1760). *Lutra vulgaris*, Erxl. (1777). *L. piscatoria*, Kerr (1792). *L. nair*, F. Cuv. (1823), Blyth (1863), Jerdon (1867), and many others. *L. roensis*, Ogilb. (1834). *L. nudipes*, Melchior (1834). *L. indica* and *L. chinensis*, Gray (1837). *L. tarayensis*, Hodgs. (1839). *L. aurobrunnea*, Hodgs. (1839). *Lutronectes whiteleyi*, Gray (1865). *Barangia* (?) *nepalensis*, Gray (1865). *Lutra angustifrons*, Lataste (1885).

B. Lutra barang, F. Cuv.

Syn. "Simung," Raffl. (1822). *L. barang*, F. Cuv. (1823), Less. (1827), Fisch. (1829). *L. simung*, Less. (1827), Horsf. (1851). *L. monticola*, Hodgs. (1839), Gray (1846, 1865, 1869), Gerrard (1862), and many others. *L. macrodus*, Gray (1865). *L. ellioti*, Anderson (1873), Blanford (1888).

C. Lutra sumatrana, Gray.

Syn. "Barang," Raffl. (1822). *L. barang*, Cantor (1846), Gerrard (1862). *Barangia sumatrana*, Gray (1865, 1869). *Lutra sumatrana*, Anderson (1878), Blanford (1888).

D. Lutra cinerea, Ill.

Syn. "Grijze Otter," Van Wurmb (1780). *L. cinerea*, Ill. (1815). *L. leptonyx*, Horsf. (1824), Fisch. (1829), Blyth (1863), Jerdon (1867), Anderson (1878), Blanford (1888), and most authors. *L. perspicillata*, I. Geoff. (1829). *Aonyx horsfieldi*, Gray (1837). *L. indigitata*, Hodgs. (1839). *Aonyx sikimensis*, Hodgs. (1855). *Aonyx leptonyx* and *indigitata*, Gray (1865, 1869). *L. swinhoei*, Gray (1867).

[1] P. Z. S. 1870, p. 625.

ETHIOPIAN OTTERS.

The Otters of the African Region present no difficulty whatever as to their definition. Two species only are known, the large clawless one of South and West Africa, and the smaller clawed *L. maculicollis*. Of the three early names for the former species authors have, as usual, carefully avoided the one that has priority, although constantly putting it down as a synonym, and have divided their attentions between "*L. inunguis*" and "*L. lalandii*."

The following appears to be the proper synonymy of the two species:—

1. Lutra capensis.

L. capensis, Schinz, Cuv. Thierr. i. p. 214 (1821).
L. inunguis, F. Cuv. Dict. Sci. Nat. xxvii. p. 247 (1823).
Aonyx delalandi, Less. Man. Mamm. p. 157 (1827).
Lutra poensis, Waterh.[1] P. Z. S. 1838, p. 60.
Anahyster calabaricus, Murr. P. Roy. Phys. Soc. Edinb. ii. p. 158 (1860).
Lutra lenoiri, Rochebr. Vertébr. Nov. Afr. Occ. sér. 3, p. 9, 1888(?). (Privately printed, and probably not really published at all in the technical sense of the word.)

2. Lutra maculicollis.

Lutra maculicollis, Licht. Arch. f. Nat. 1835, i. p. 89, pl. ii. fig. 1 (animal).
Lutra grayi, Verr. *apud* Gray (never described).
Hydrogale maculicollis, Gray, P. Z. S. 1865, p. 132.

AMERICAN OTTERS.

It is due to the want of material and other difficulties in connection with the American, and especially the South-American, Otters, that the present paper is necessarily only a preliminary account of the genus, and not a complete monograph. But I may be permitted to express a hope that collectors and others having opportunities of obtaining Otters from the tropical parts of South America will aid in the future revision of the genus by contributing to our National Collection any specimens that they may be able to procure.

Although, therefore, I am unable to work out the New-World Otters completely, the following points at least seem to be fairly clear, and may be of service to future workers on the subject.

As to the common North-American Otter nothing but a passing reference is necessary, as its synonymy and characteristics have been fully worked out and described by Dr. Elliott Coues[2]. It may be

[1] This name probably belongs here, but the typical skin, being without feet or skull, it is impossible to be quite certain until further specimens are obtained from the same locality. The same may be said of "*Lutra lenoiri*" on account of the absence, as usual, of all diagnostic characters in what its describer calls a "diagnosis."

[2] Fur-bearing Animals, p. 295 (1877).

noted, however, that Kerr[1], and not Turton, is the earliest authority for the scientific name *Lutra canadensis*; also that F. Cuvier's "*L. canadensis*"[2] appears not to be this species at all, having been founded on a skull which, although marked "Loutre du Canada," proves, on a personal examination in the Paris Museum, to be really referable to *L. vulgaris*. This point is of some importance in relation to the same author's description of his "*Lutra canadia*," as the characters of the latter, which he compares to those of "l'espèce précédente," would be quite inexplicable were the latter the true Canadian Otter (viz. *Lutra lataxina*).

Of the Neotropical species I may first give the synonymy of the [illegible] Otter of the rivers of Guiana and Brazil. This [illegible] is unmistakable, as accepted by Humboldt and Schinz, the original *Lutra brasiliensis* of the early authors, a name that Dr. [illegible] applied to one of the [illegible] species, while he called the [illegible] animal "*Pteronura sandbachii*." The claims of this Otter [illegible] and have [illegible] its specific synonymy [illegible] as follows —

[illegible] BRASILIENSIS

[illegible] *brasiliensis*. Zimm. [illegible], i. p. [illegible], [illegible] of [illegible]. [illegible] Zimmerm. Humb. Schinz, and [illegible] [illegible] [illegible].

[illegible] *nigra* and *variegata*. Pallas, Spic. Zool. fasc. [illegible]. p. 2 [illegible]

[illegible] Ann. Nat. Hist. [illegible]

[illegible] [illegible] [illegible] [

where its range meets that of the larger Brazilian Otter[1]. Thence northward it is exceedingly common along the coasts of Patagonia and Chili, where the complex labyrinths of gulfs and channels are highly favourable to its manner of life. It has been found in Peru, and in Ecuador it has been recorded from San Lorenzo. In addition, it has been stated to occur in Central America, in California, and Kamtschatka. The Central-American locality has already been disposed of. That of Kamtschatka rests on two skins, now in the British Museum, received from the French dealer Verreaux in 1856, and certainly belonging to *L. felina*; their evidence, however, would no doubt have long ago been rejected, had it not been partially confirmed by Dr. Gray's description of a "*L. californica*," afterwards, and rightly, attributed to this species. The type of *L. californica* was obtained and presented to the Museum by Capt. P. P. King; but not only has the locality never been confirmed, a most significant fact in so well-known a country, but there is also no mention of California in that officer's account of his surveying-voyage. His other specimens all came from Patagonia, and I suspect that "California" was copied by mistake for "Patagonia," a word not unlike it in manuscript. My conclusion, therefore, is that in all probability the type of "*L. californica*" really came from Patagonia; that the locality of Verreaux's "Kamtschatkan" specimens is erroneous; that Pallas's "*Viverra aterrima*"[2] is not this species, as has been suggested; and as a result of these conclusions, that *L. felina* does not really range northwards beyond Ecuador.

The following is its synonymy:—

LUTRA FELINA.

Mustela felina, Mol. Sagg. Storia Nat. Chili, p. 342 (1782).

Mustela (*Lutra*) *chilensis*, Kerr, Linn. An. K. i. p. 172 (1792).

Lutra felina, Shaw, Gen. Zool. i. pt. ii. p. 448 (1800) (and of Gray and other authors referring to Peruvian, Chilian, and Magellan Otters, but not of Coues, Alston, and others describing Central-American specimens).

Lutra chilensis, Benn. P. Z. S. 1832, p. 1.

Lutra californica, Gray, Charlesw. Mag. N. H. i. p. 580 (1837).

Lutra peruviensis, Gerv. Voy. Bonite, i. p. 15, Atl. pl. iii. figs. 4 & 5 (skull) (1841).

Lutra brachydactyla, Wagn. Schr. Säug. Supp. ii. p. 261 (1842).

Nutria felina, Gray, P. Z. S. 1865, p. 128; Cat. Carn. B. M. p. 106 (1869).

Turning now to the smaller Otters of Brazil, larger, indeed, than *L. felina*, but markedly smaller than *L. brasiliensis*, we are confronted with a problem that I am as yet unable to elucidate. The characters of the nose-pad and the proportions of the skull and teeth appear

[1] One of the Otter-skins obtained by Dr. Coppinger in the Straits of Magellan during the voyage of the 'Alert,' and referred by me to *L. felina* (P. Z. S. 1881, p. 3), proves, on an examination of its skull, to be really of the same type as "*L. paranensis*." The other specimens mentioned are all really *L. felina*.

[2] Zoogr. Ross.-Asiat. i. p. 81 (1811).

noted, however, that Kerr[1], and not Turton, is the earliest authority for the scientific name *Lutra canadensis*; also that F. Cuvier's "*L. canadensis*"[2] appears not to be this species at all, having been founded on a skull which, although marked "Loutre du Canada," proves, on a personal examination in the Paris Museum, to be really referable to *L. vulgaris*. This point is of some importance in relation to the same author's description of his "*Lutra enudris*," as the characters of the latter, which he compares to those of "l'espèce précédente," would be quite inexplicable were the latter the true Canadian Otter (his *Lutra lataxina*).

Of the Neotropical species I may first give the synonymy of the great Margined-tailed Otter of the rivers of Guiana and Brazil. This Otter is unquestionably, as suggested by Hensel and Nehring, the original *Lutra brasiliensis* of the early authors, a name that Dr. Gray wrongly applied to one of the smaller species, while he called the present animal "*Pteronura sambachii*." The claims of this Otter to generic rank have already been discussed; its specific synonymy is as follows:—

LUTRA BRASILIENSIS.

Lutra brasiliensis, Zimm. Geogr. Gesch. ii. p. 316 (1780) (also of Kerr, F. Cuvier, Fischer, Burmeister, Hensel, Nehring, and others, but not of Gray).

Lutra lupina and *paraguaensis*[3], Schinz, Cuv. Thierr. i. p. 213 (1821).

Pteronura sambachii[4], Gray, Charlesw. Mag. N. H. i. p. 580 (1837).

Of the other Neotropical Otters, Gray has associated the S. Brazilian "*L. platensis*" with the Chilian *L. felina*; and Alston[5] has placed the Central-American Otter under the same specific name. The typical skull of *L. platensis* and also the specimen collected by Mr. Salvin at Santana Mixtan in Guatemala and referred to by Mr. Alston, are both, however, of the type found in Brazil and Guiana, to be referred to further on, and are markedly distinct from the true *L. felina*. The latter species is readily distinguishable from all other American Otters by its very much smaller size, the basal length of its skull being only about 80 to 85 millim. as compared to 95 or 100 in the eastern species, by its relatively shorter face, and by its lighter and more delicate teeth. The internal lobe of its upper p.[4] is only about one half the size of that of '*L. platensis*' and its allies. The species also differs from other Otters in being almost exclusively marine in its habits.

The distribution of *L. felina* presents some points for consideration. In the southern hemisphere it extends to the Straits of Magellan,

[1] *Mustela* (*Lutra*) *canadensis*, Kerr, Linn. An. K. i. p. 173 (1792).
[2] Dict. Sci. Nat. xxvii. p. 242 (1823).
[3] Not *Mustela* (*Lutra*) *paraguensis*, Kerr, Linn. An. K. p. 172 (1792), which is *Chironectes minimus*.
[4] Afterwards spelt "*sandbachii*."
[5] Biol. Centr.-Am., Mamm. p. 87 (1880).

that one of the best and most convenient methods of preserving Otters for scientific purposes is simply by cutting off their heads and putting these into spirit. By this means the characters of the nose-pad are preserved, the skull is available for examination if necessary, and the collector is saved the trouble and expense incidental to skinning or sending home the whole animal. Where this is done, however, the sex of each individual should be carefully noted, and marked on a label attached to the head.

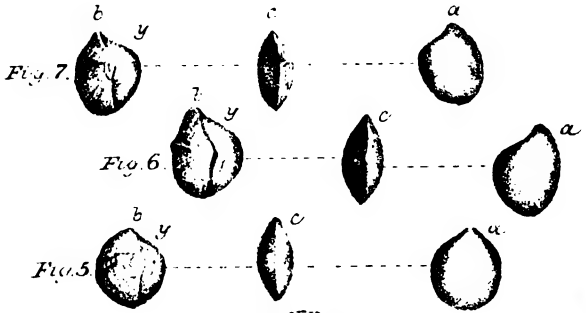
Finally it may be of use to give a few of the more diagnostic cranial measurements of the Otters above recognized, since a comparison of the basal length, interorbital breadth, and "lobe-measurement" will enable students in most cases to recognize the species from these few dimensions only. The species are here arranged in order of size, based upon the basal length.

The "lobe-measurement" of $\underline{p}.^4$ is the distance in a straight antero-posterior line from the most anterior point of the tooth to the most posterior point of the hinder convex edge of its inner lobe. This measurement includes, it is true, a part of the tooth not belonging to the inner lobe, but there appears to be no other way of satisfactorily estimating the size of the lobe. The "basal length" is of course from the basion (back of the basioccipital in the median line) to the gnathion (most anterior point of the premaxillæ). The fairly constant "interorbital" must not be confused with the varying and changeable "intertemporal" breadth.

	Basal length.	Interorbital breadth.	Lobe-measurement of p.[4]
Lutra brasiliensis, ♀	141·5	18·0	16·1
,, *capensis* (♂)	129	32·5	13·8
,, ,, (♀)	118	26·4	14·0
,, *barang*, ♂	118	26·5	12·7
,, ,, (♀).....	108·5	20·8	11·8
,, *vulgaris*, ♂	114	22·5	8·8
,, ,, (♀)	104·8	19·8	8·4
,, *sumatrana* (♂) .....(c.)	112	18·8[1]	9·2
,, ,, ♀ ..... (c.)	98	15·2	8·5
,, *canadensis*, ♂	101·5	24·5	10·1
,, *paranensis*[2]	97	22·5	9·8
,, *maculicollis*, ♂	96·2	15·5	8·9
,, *felina*, ♂	80·3	20·0	10·0
,, ,, ♀	84·2	21·8	8·6
,, *cinerea*, ♂	82·2	20·5	9·0
,, ,, ♀ ..... (c.)	82·0	18·0	9·5

[1] The sex-mark is here, as elsewhere, placed within brackets where the sex is only presumed from the form or relative size of the skull, and is not known from external or historical evidence.

[2] From the type specimen of *L. platensis*, Waterh.



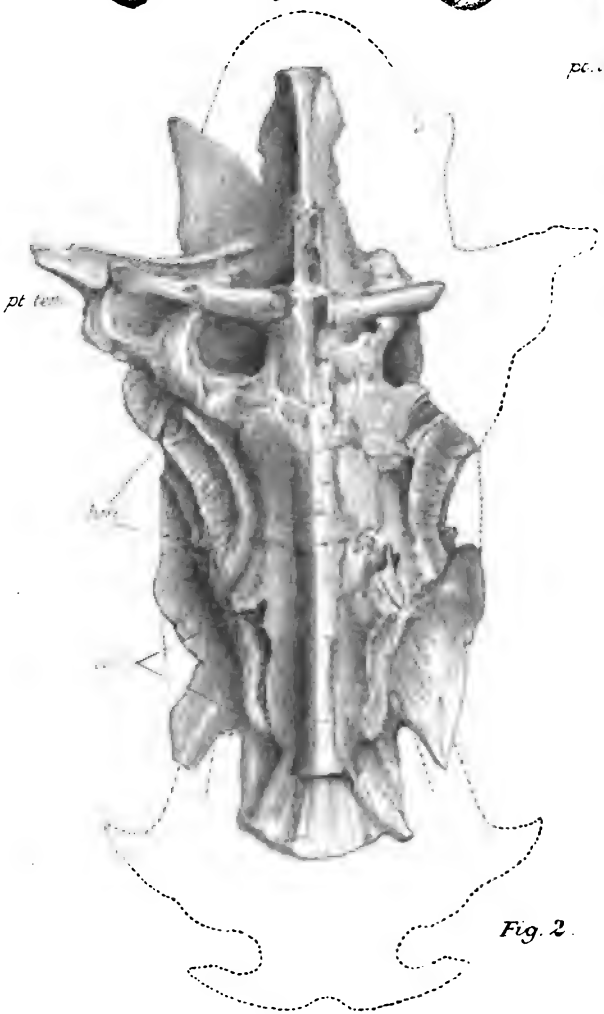


Fig. 2.

C. Berjeau lith.

Fig. 8
$\frac{2}{3}$

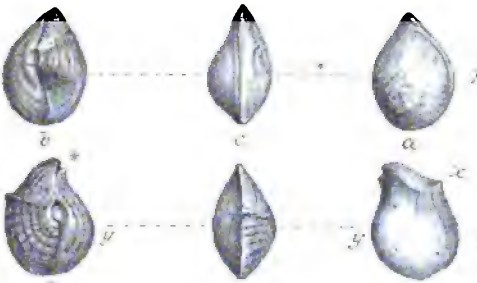


Fig. 4.

Fig. 3.

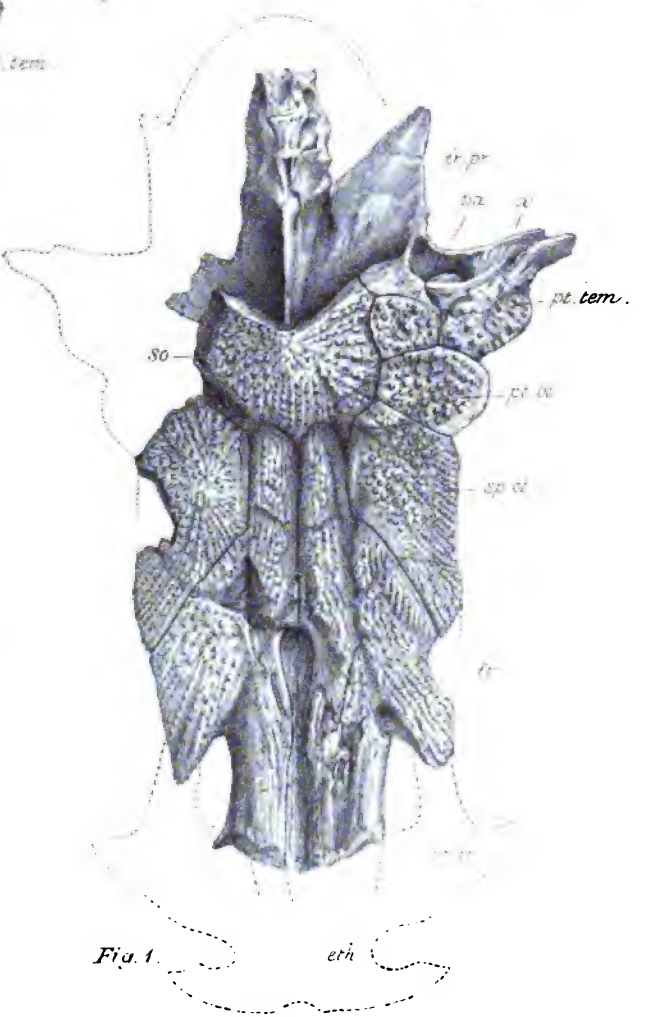
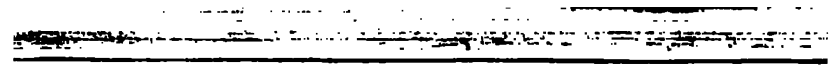


Fig. 1.

Fig 10.

Hanhart imp.

FISHES



3. A Contribution to the History of Eocene Siluroid Fishes. By E. T. Newton, F.G.S., F.Z.S.

[Received March 14, 1889.]

(Plate XXI.)

The pectoral and dorsal spines of Siluroid fishes from Brackle-sham, which were referred to the genus *Silurus* by Dixon (2[1]), have recently been studied by Mr. A. Smith Woodward (12), who has shown the improbability of these remains belonging to the temperate genus *Silurus* and the close relationship existing between them and the widely distributed tropical genus *Arius*. In addition to the spines and pectoral arch, named by Dixon *Silurus egertoni*, Mr. S. Woodward has called attention to several other specimens, some from the Upper Eocene of Barton, preserved with the types in the British Museum, among which are bones of the skull and notably some large and characteristic supraoccipitals, one of which he figures; these he also refers to *Arius egertoni*. Some smaller spines with a double curvature, from Barton, he places in a new species, *Arius* (?) *bartonensis*.

The Museum of Practical Geology now possesses the greater part of a skull from the Eocene beds of Barton (Plate XXI. figs. 1, 2, 3), which confirms in a most satisfactory manner Mr. S. Woodward's reference of the Eocene Siluroids to the genus *Arius*. The skull is somewhat crushed, but the bones are still in position, and by careful manipulation both the upper and under surfaces have been exposed. The ethmoid, prefrontals, and part of the supraoccipital are wanting, and on the right side the temporal region is broken, but on the left only one of the temporal plates is lost.

All the bones of the upper surface, which are preserved, are ornamented with rounded granules, and these in nearly all cases radiate from an ill-defined centre towards the margins of the bone. No distinct sutures can be seen, but the ornamentation being less strongly marked towards the edges of the bones, the boundaries can be fairly well made out; the dark lines in the figure indicate these boundaries, which agree in the main with the positions of the sutures in the recent specimen with which it has been compared.

The frontals (*fr.*) occupy the anterior part of the specimen; they are narrow posteriorly and meet each other in the middle line for about half their length. The median point of the supraoccipital projects for a short distance between their hinder extremities. Anteriorly a wide and deep depression occupies the median portion of the frontals, and at the bottom of this depression a long cleft separates their inner margins. Each bone is in front divided into two parts, the outer of them no doubt joined the prefrontal and the inner the ethmoid, as in the recent *Arius*.

Behind and on the outer side, each frontal joins a plate (*sp.ot.*)

[1] These numbers refer to a list of works given p. 206.

which is also in relation with the supraoccipital (*s.o.*) and with a much smaller bone (*pt.ot.*) which lies behind it. This plate (*sp.ot.*) has on its under surface a deep depression, which evidently formed the attachment for the hyomandibular; the depression is not, however, quite confined to this plate, but seems to extend for a short distance on to the smaller bone which lies behind it. These two bones, therefore, which have combined to support the hyomandibular, are regarded as the sphenotic (*postfrontal*) and the pterotic (*squamosal*).

The last-named bone comes into relation with the supraoccipital on the inner side and has behind it two elements, the outer of which is evidently the post-temporal (*pt.tem.*) and the inner one (*pa.*) is either the parietal or epiotic. Another bone which is found behind these in the recent *Arius* has evidently been lost in this fossil. The post-temporal (*pt.tem.*) has a peculiar and characteristic structure. On the upper surface of the skull it presents a flattened tuberculated plate, which, a comparison with the recent *Arius gagorides* shows, is composed of two parts—an anterior, united with the pterotic, and a hinder one attached to the bone directly on its inner side, the parietal (or epiotic), and extending as far as the supraoccipital. The post-temporal must also have been in close relation with the bone behind it, which has been lost; but the smooth surface now exposed does not indicate a close attachment. The outer extremity of the post-temporal has a very distinct socket for the upper part of the supraclavicular, and from below this a strong bar of bone passes downwards and inwards quite to the base of the skull, to which it has been firmly attached. There is a thin plate of bone (*x*) behind this bar, which seems to have been separated from it by the crushing of the skull, that passes backwards and inwards, seemingly to join the broad thin horizontal plate formed by the transverse processes of the vertebræ; indeed, it may be that this is a part of the transverse process, extending forward to join the post-temporal.

The hinder part of the supraoccipital is wanting, but the front part is preserved and is somewhat shield-shaped, having its margins on each side indented by a series of curves where it is united with the frontal, sphenotic, pterotic, and parietal. The hindermost temporal plate, now wanting, was doubtless also in contact with the supraoccipital.

The base of the skull is much crushed, but it seems quite certain that the brain-cavity was completely enclosed by bony walls. The buttress-like supports of the post-temporal bones are striking features of this region. Just in front of the left buttress may be seen the remains of an inflated bulla, which lodged one of the large otoliths, and still further forward there is on each side a depression for the attachment of the hyomandibular (*hm.*). In front of this again is another pair of elongated depressions, evidently the ethmoid attachments for the prefrontals (fig. 2, *eth.*). The most anterior part of the base, in its present condition, is formed by a fan-shaped mass, which is apparently in part the vomer and in part the ethmoid.

Three or four of the anterior vertebræ are firmly united to each

other, so that the centra appear as one bone closely united to the basioccipital, and at their point of union with the latter bone there is a strong downwardly directed process.

The *Arius* skull most closely resembling this fossil is one in the British Museum, which Dr. Günther assures me is almost certainly *Arius gagorides*. The correspondence between this and the fossil is so close as to leave no doubt as to their generic identity, and the following comparisons refer to this specimen. I have to acknowledge my indebtedness to Dr. Günther, who on this, as on many other occasions, has spared no trouble in order to facilitate my examination of the specimens under his charge, thereby enabling me to settle the affinities of this fossil fish in a manner which would not otherwise have been possible.

The frontals of *A. gagorides* (fig. 8, *fr.*) differ from those of the Barton fossil in having the median cleft extended further backwards, and their hinder ends are proportionately wider. The latter character is in relation to the form of the sphenotics, which are relatively narrower at their hinder part than is the case in the fossil.

In ordinary bony fishes the post-temporal is connected with the skull by two processes, one of which is attached to the pterotic (*squamosal*) and the other to the epiotic; but the post-temporal of *A. gagorides* has in addition to these a third attachment by means of a long bar extending from its under surface to the base of the skull (fig. 9), and in addition to this there is a thin plate of bone, which may be a process of the post-temporal, extending under the epiotic to the transverse process of the vertebræ. The two upper processes of the post-temporal are ornamented on their upper surface with tubercles, and between them and the pterotic an opening is left which seems to vary in extent in different specimens. The bone to which the hinder of these processes is attached appears from its connections and relations to the auditory region to be the epiotic; but it may be the parietal. If the latter be the correct interpretation, then the ossicle behind it may be the epiotic; and the hinder process of the post-temporal certainly reaches thus far. On the other hand, if the parietal be absent and this bone be the epiotic, then the hinder plate will probably be a supernumerary temporal plate, wedged in between the wide hinder moiety of the supraoccipital and the epiotic.

The post-temporal bone of *Arius gagorides* has the same structure and relations as that described in the Barton skull; but the opening left between its two upper processes is not seen in the fossil. This feature, however, varies even in the recent species, and in the fossil the two processes evidently have joined and obliterated the space.

The pterotic and parietal elements are larger than in the fossil, the last-named bone reaching to the margin of the bony cephalic shield, while in the fossil it seems probable that the epiotic and post-temporal bones excluded it from the margin.

The supraoccipital of *A. gagorides* is an elongated bone constricted in the middle, the portion in front of the constriction corresponding with the part preserved in the fossil. In the main

the indentations of the margin are alike in the two forms, but the supraoccipital of the fossil is evidently a shorter and wider bone, and it is uncertain whether it was constricted in the middle or not. The supraoccipital of *A. egertoni* is only slightly constricted, and it may be that the Barton skull, here described, more resembled that species.

Several of the anterior vertebræ of *A. gagorides* are united to form one mass, in a manner precisely similar to that which obtains in the fossil.

The differences above noted show clearly that the recent and fossil forms are specifically distinct, while at the same time the resemblances are sufficiently important to prevent a generic separation; but there is still some additional evidence which supports this decision in an unexpected manner.

While clearing away the matrix from the right side of the fossil skull, where it is broken near the back, I was fortunate enough to find one of the otoliths in place, and this, when extracted, proved to be of a remarkable form (figs. 3, *a*, *b*, *c*), and quite unlike the otolith of any fish with which I was acquainted.

When found, this otolith had the more pointed end directed backwards and outwards, with the smooth surface upwards; and as it seemed to be in its natural cavity, for the present this is regarded as its proper position; but seeing that the otolith of the opposite side is not in its place, and that in the dried skull of the recent species they are loose in the brain-cavity, this may not be correct.

The otolith is proportionately large and thick, its upper surface (*a*) is smooth and convex, while its lower surface (*b*) is rugose and much more convex. At first sight there appears to be no *sulcus acusticus*, but probably it is represented by the sinuous groove on the lower surface which passes from the hinder pointed end to the opposite extremity, that is between the two stars in figure 3 *b*. The rugosity of the under surface is due to a number of concentric striations, or lines of growth, crossed by several radiating ridges which are stronger on the inner than on the outer portion. One of the radiating ridges is especially strong, and forms a prominent angle where it reaches the inner margin, towards the front of the otolith (fig. 3 *b*, *x*). The pointed extremity is seen to be notched, a slight groove extending from this both on the upper and lower surfaces (figs. 3 *a*, *b*). From this bifid point a shallow groove extends along the outer margin, becoming a mere line towards the front; it is seen in an upper view (fig. 3 *a*), and is separated from the smooth upper surface by a fine but distinct raised line.

A similar otolith to this is figured by Herr E. Koken, from the Oligocene of Headon Hill, Isle of Wight (6), who, having no clue to its affinities, called it *Otolithus* (*incertæ sedis*) *crassus*.

The close relationship between the recent *Arius gagorides* and the Barton fossil skull made it particularly desirable to see whether the otoliths would show a corresponding resemblance, and Dr. Günther very kindly had the otoliths taken out of the skull with which the above comparisons had been made. One of these otoliths is repre-

sented by figure 10, and it will be seen that all the points mentioned as characteristic of the fossil otolith are repeated in this, and it is only in outline that there is any real difference. The projection of the inner margin marked *x* (fig. 10 *b*) is in a depression and does not form a prominent angle as in the fossil (fig. 3 *b*), and the swelling of the outer margin (*y*) is, in *A. gagorides*, placed further backwards than in the fossil.

Unfortunately, the otoliths of nearly allied recent species or genera are not available for comparison, and consequently we know nothing of their specific differences. In the collection of Fish otoliths preserved in the Hunterian Museum of the Royal College of Surgeons there are a few belonging to Siluroids, but none of them to genera nearly allied to *Arius*, and they all differ widely from the otolith of *Arius gagorides*.

The series of otoliths from the Upper Eocene of Barton, preserved in the British Museum, includes many which agree with *A. gagorides* in these main characters which seem to me to be generic, and these, therefore, I also refer to the genus *Arius*. Besides differences of size, which in part no doubt are due to age, these otoliths present several distinct forms, which I believe will be found to represent at least three species, in addition to the skull above described. The largest of these (fig. 4) is a little longer and more regularly oval than that found in the Barton skull; its lower surface is also flatter, and its upper surface is raised into an almost conical boss.

The second form to be noticed (fig. 5) is smaller, flatter, and more rounded in outline, having the hinder point only slightly produced.

The third form (fig. 6) is likewise flat and about the same size as the one last noticed; in outline, however, it more resembles that of *A. gagorides*, but the swelling of the outer side (*y*) is not thrown so much backwards as in that species.

There is still another form of *Arius* otolith to which I should like to call attention. Among the fossils brought from Madagascar by the Rev. R. Baron, and noticed in his paper read before the Geological Society (Mar. 6, 1889), were some small otoliths (fig. 7) which he had collected in the village of Ankoala, where they occurred in some numbers scattered over the surface of the ground. These otoliths bear such a close resemblance to some of those from the Eocene beds of Barton, that they not unnaturally led to the supposition that they also were of Eocene age; but both these forms are referable to the living genus *Arius*, which is a widely distributed tropical form, and it seems very probable, therefore, that the Ankoala specimens may prove to be of much more recent origin, and the peculiar conditions under which they were found seem to point to their belonging to a living species.

We have now to consider the relation which the Barton skull and the otoliths above described bear to the specimens referred to *Arius egertoni* and to *A.* ? *bartonensis*; and before doing so I may say that I quite agree with Mr. Smith Woodward's reference of the cephalic plates from Bracklesham to the species *A. egertoni*; for their

ornamentation is peculiar and exactly corresponds with that found on the pectoral plate originally described by Dixon. The tubercles on all these specimens are sharp, conical, and more or less connected together by ridges which give a reticulated appearance to the plates when closely examined. Spines which cannot be distinguished from those of *A. egertoni* are found at Barton; but the skull above described differs from *A. egertoni* in several particulars, although it is only the supraoccipital bone which is available for comparison. This bone, so far as it is preserved, has a different form from that of *A. egertoni*, being proportionally wider and with less deeply grooved mucus-canals. The ornamentation of the bones, likewise, is of another character; the tubercles are more numerous, more rounded, and with little or no indication of the reticular structure between them; moreover, they have a greater tendency to run together in radiating lines, and to become less distinct towards the margins of the bones. It will be obvious that this skull cannot be referred to *A. egertoni*, and there seems no good grounds for referring it to *A.? bartonensis*, which is a smaller form and not certainly belonging to the genus *Arius*. On the other hand, there can be no question as to the otolith found in this skull being specifically identical with the one figured and described by Herr E. Koken (6) as *Otolithus* (*incertæ sedis*) *crassus*, and this specific name must therefore be adopted for our specimen, which will henceforth be known as *Arius crassus*. Should the spines called *A. bartonensis* prove eventually to belong to the same species, the name of *A. crassus* having priority will have to be retained, although it may be a less appropriate cognomen. According to Herr Koken this form of otolith has been found at Headon Hill, Isle of Wight, and also in Oligocene strata at Lattorf, Cassel, Westeregeln, and Waldböckelheim, in Germany. The specimen from the Miocene of Tortonese, referred to by Herr Koken as possibly belonging to this species, which is figured by Dr. Sismonda (Mem. Accad. Sci. Torino, 1849, ser. 2, vol. x. pl. 2. fig. 71), does not seem to me to belong to the genus *Arius*.

It is quite likely that one or other of the three forms of otoliths from Barton may belong to *A. egertoni* or *A. bartonensis*; but it is likely to be long before the means of correlating them will be found, and I have thought it best to distinguish them provisionally as *Arius* (*otolithus*) sp. A (fig. 4), *Arius* (*otolithus*) sp. B (fig. 5), and *Arius* (*otolithus*) sp. C (fig. 6).

Should the otolith from Ankoala, Madagascar (fig. 7), prove to belong to an undescribed species, I would suggest that it be named after the gentleman who brought it to this country, *Arius baroni*.

Works that may be consulted on Fossil Siluroid Fishes.

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3. Günther, A.—"Contributions to our Knowledge of the Fish

Fauna of the Tertiary Deposits of the Highlands of Padung, Sumatra." Geol. Mag. dec. 2, vol. iii. p. 433 (1876).
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6. Koken, E.—"Ueber Fisch-Otolithen &c." Zeitschr. deutsch. geol. Gesell. vol. xxxvi. p. 559, pl. xii. fig. 13 (1884).
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9. Lydekker, R.—Siwalic Crocodilia &c. and Tertiary Fishes. Palæont. Indica, ser. x. vol. iii. p. 246 (1886).
10. Marck, W. von der.—"Neue Fische und Krebse aus der Kreide von Westphalien." Palæontogr. vol. xv. p. 276 (1868); and vol. xxxi. p. 248 (1885).
11. Sauvage, H. E., in C. Depéret's "Description Géologique du Bassin Tertiaire du Roussillon." Ann. d. Sci. Géol. vol. xvii. p. 223 (1885).
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13. Woodward, A. Smith.—"On *Bucklandium diluvii*, Koenig; a Siluroid fish from the London Clay of Sheppey." Brit. Assoc. Rep. 1888, and Ann. & Mag. Nat. Hist. ser. 6, vol. ii. p. 355 (1888).
14. Zittel, Karl A.—Handbuch der Palaeontologie, vol. iii. p. 360 (1888).

EXPLANATION OF PLATE XXI.

All the figures are natural size except numbers 8 and 9, which are reduced one third.

Fig. 1. *Arius crassus*, Koken. Skull from the Upper Eocene of Barton, in the Museum of Practical Geology, upper surface.
2. Same specimen, under surface.
3. Otolith from right side of same specimen: *a*, upper surface; *b*, lower surface; *c*, side view.
4. *Arius* species A. Otolith (left?) from Upper Eocene of Barton, in the British Museum.
5. *Arius* species B. Otolith (right?); ditto, ditto.
6. *Arius* species C. Otolith (right?); ditto, ditto.
7. *Arius baroni*, n. sp. Otolith (right?) from Ankoala, Madagascar, in the Baron Collection, British Museum.
8. *Arius gagorides*, Cuv. & Val. (living species, from Calcutta). Upper surface of left half of a skull 8½ inches long, two thirds natural size. In the British Museum.
9. Same specimen, lower surface.
10. Otolith (right?) from same specimen, natural size; letters as in figure 3.

s.o., supraoccipital; *ep.ot.*, epiotic (?); *pa.*, parietal (?); *pt.tem.*, post temporal; *pt.ot.*, pterotic; *sp.ot.*, sphenotic; *fr.*, frontal; *pr.fr.*, prefrontal; *eth.*, ethmoid; *tr.pr.*, transverse process of vertebra; *hm.*, articulation for hyomandibular.

4. Note on *Bucklandium diluvii*, König, a Siluroid Fish from the London Clay of Sheppey. By A. Smith Woodward, F.Z.S., F.G.S., of the British Museum (Nat. Hist.).

[Received March 30, 1889.]

(Plate XXII.)

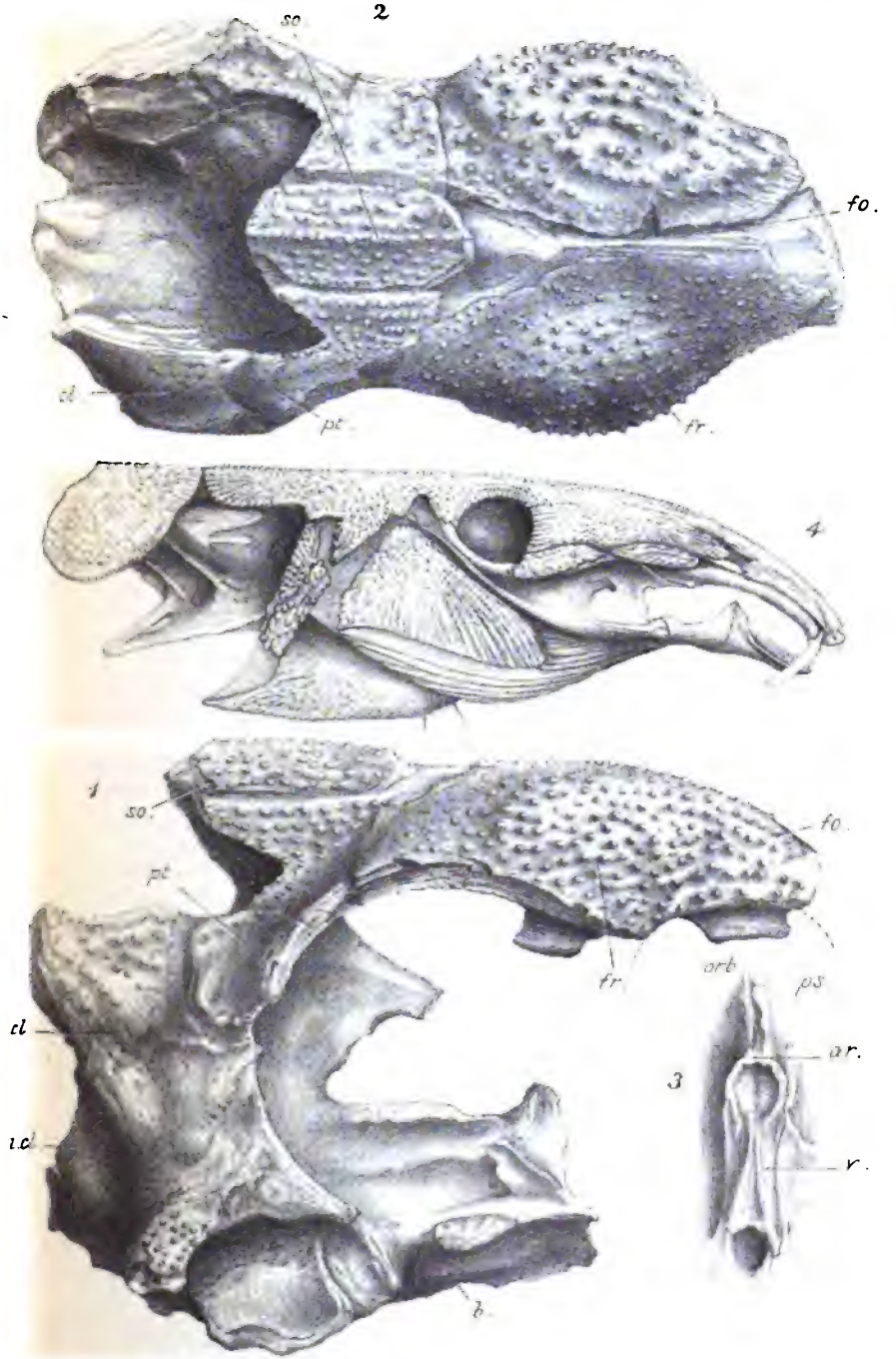
In his well-known 'Icones Fossilium Sectiles,' pl. viii. no. 91, König figured a remarkable fossil from the London Clay of the Isle of Sheppey, which he mentioned in the text as not certainly determinable, but generally regarded by the anatomists who had examined it as pertaining to some type of Lizard. In 1843 Morris [1] recognized the piscine nature of this fossil and assigned it to the Acanthopterygian *Ephippus*; while Pictet [2] afterwards suspected that it might be identical with the so-called *Glyptocephalus* of Agassiz, which had not been described, but was considered to pertain to an early Eocene type of Scleroderm Teleostean.

The unique specimen in question is preserved in the British Museum, where it has long been placed among the fossil fishes of uncertain position by Mr. William Davies; and in the Reports of the last meeting of the British Association (p. 679) the present writer has pointed out that it represents the head and pectoral arch of the earliest undoubted Siluroid fish hitherto discovered. The original figures of König, however, do not suffice for the demonstration of its characters; and it is the object of the present note briefly to describe the main points with the aid of the accompanying Plate XXII.

The fossil exhibits the hinder half of the roof of the skull, with the greater portion of the pectoral arch in position, though slightly bent backwards; and the mass of anchylosed vertebræ, with the base of the cranium, is displaced downwards and thrown beneath the clavicles. All the bones are remarkably strong, and the exposed surfaces are ornamented with irregularly scattered pointed tubercles; but in the extrication from the hardened clayey matrix the precise form of the inner elements has unfortunately been destroyed.

The head must have been originally at least as deep as broad (Plate XXII. fig. 1), and the roof exhibits very little flattening, but is strongly arched from side to side (fig. 2). Posteriorly, the supraoccipital (*so.*) projects in the usual manner, probably to meet a dermal plate upon the nape; and the posttemporal element (*pt.*) seems to be merged with the bones of the postero-lateral angles of the cranium. The supraoccipital has been partly broken during extrication from the matrix, but a sharp median ridge is seen to extend throughout its length, and from this on each side there is a steep slope. The frontals (*fr.*) probably meet in front, and the central crest then disappears. All the cranial bones, however, are indistinguishably

[1] J. Morris, 'Catalogue of British Fossils,' p. 193.
[2] F. J. Pictet, 'Traité de Paléontologie,' 2nd edit., vol. ii. p. 123.



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BUCKLANDIUM DILUVII.

fused together, and the superficial tubercular ornament is so sparse and exhibits so indefinite an arrangement, that not even an approximate determination of the original sutures can be attempted. The only noteworthy feature is the complete absence of tubercles upon a narrow longitudinal area (*fo.*) in the median line commencing somewhat in advance of the supraoccipital, gradually widening in front, and evidently passing into an elongated frontal fontanelle.

The hinder margin of the cranial roof is not much broken, and so displays the posterior extent of the supraoccipital; but the only portion of the lateral margin is the superior border of the right orbit (*orb.*), which is interesting as showing the forward position of the eye. Seen from beneath, a kind of sudden thickening of the roof-bones is observed to commence at a short distance behind the orbit, producing the appearance of a deep fossa anteriorly; but no precise information can be obtained as to the characters either of the brain-case or the otic bones.

The displaced base of the skull and the anchylosed vertebræ are too imperfect for description; but the basioccipital and parasphenoid appear to be narrow (fig. 3, *ps.*), while the side-walls of the skull rapidly slope upwards. At the union of the basioccipital with the anterior vertebræ (*ar.*) there is a broad downwardly-directed angular process of bone; and the furrow along the inferior aspect of the anchylosed centra (*v.*) is shallow.

The posttemporal bone (figs. 1, 2, *pt.*), though firmly fused with the cranium, is sharply separated by suture from the anterior upper angle of the clavicle; it is broad throughout its length, gradually expanding towards its distal articulation. The pectoral arch is best preserved on the right side, though even here only fragments of the ornamented dermal plate of the clavicle remain; and the articular facettes for the spine, equally with the infraclavicular plates, are mutilated beyond precise recognition. The clavicular element (*cl.*), evidently comprising, as usual, the supraclavicle of ordinary Teleosteans, is about twice as deep as broad and does not taper, but rather expands inferiorly. Its lower boundary is arched and seems to have projected over the base of the pectoral spine; a thin flat plate of bone extends directly inwards from the lower half of its curved front margin; and a more robust bony plate similarly proceeds inwards from the lower half of the hinder margin and bulges postero-inferiorly in such a manner as to suggest its being an upward extension of the infraclavicle (*i.cl.*).

Such being the characters of the fossil, it obviously resembles the skull and pectoral arch of recent Siluroids with sufficient closeness to be placed in that great group of Teleostei. Without a knowledge of other portions of the fish, however, it is impossible to determine the precise affinities of *Bucklandium* in the usual manner. It must suffice merely to compare the specimen with the skulls of various recent genera, and thus arrive at an approximate determination.

So far as the writer has been able to observe, the London Clay genus most closely approaches the living *Auchenoglanis* of the Nile and West-African rivers; and a reduced side view of the head, ante-

rior vertebræ, and pectoral arch of this fish is given for comparison (Plate XXII. fig. 4).

Notwithstanding the general resemblance, it will be seen that there are several important differences of detail. In the recent fish the sutures are persistent, the head is broader and flatter, and the orbit and frontal fontanelle much smaller. The posttemporal and pectoral arch are also relatively smaller, and the latter tapers below; while the infraclavicle appears to be much less developed.

König's name of *Bucklandium diluvii* may thus be retained for the fossil now described, and, upon present evidence, this Eocene fish may be most closely associated with an African type. It ought to be remembered, however, that most of the living allies of *Auchenoglanis* are denizens of South America; and in this connection it is interesting to note a fact kindly communicated by Mr. Etheridge, that the molluscan fauna of the London Clay has about as many living representatives upon the south-east coast of North America as upon the western coast of Africa.

EXPLANATION OF PLATE XXII.

Fig. 1. *Bucklandium diluvii*; side view of an imperfect skull and pectoral arch, from the London Clay of the Isle of Sheppey. *b*, displaced base of the cranium; *cl.*, clavicle; *fo.*, frontal fontanelle; *fr.*, frontal; *i.cl.*, ascending plate of infraclavicle; *orb.*, orbit; *pt.*, posttemporal; *so.*, supraoccipital.

2. Ditto; upper view of the same specimen. Lettering as above.

3. Ditto; lower view of part of the base of the same specimen. *ar.*, articulation of basioccipital with vertebral column; *ps.*, parasphenoid, partly overlapping basioccipital; *v.*, anchylosed anterior vertebræ.

4. *Auchenoglanis biscutatus*; side view of head, anterior vertebræ, and pectoral arch, much reduced in size.

Figs. 1–3 are all of the natural size.

5. On new Species of the Coleopterous Family *Carabidæ*, collected by Mr. J. H. Leech in Kashmir and Baltistan. By H. W. Bates, F.R.S.

[Received March 18, 1889.]

Carabus (Imaïbius) barysomus.

Robustus, elytris convexis usque post medium dilatatis; niger, nitidus, capite thoraceque subtilissime coriaceis fere lævibus, hoc transverso, cordato-quadrato, antice lato convexo, basi depresso, mox ab angulis anticis (rotundatis) valde rotundato, lateribus paullo post medium sat profunde sinuatis, deinde ad angulos posticos parallelis (angulis rectis apice obtusis); elytris grossissime subseriatim fossulatis, fossulis in fundo umbilicatis, hic illic confluentibus; corpore subtus impunctato.

Long. 35–38 millim. ♂ ♀.

Goorais Valley.

With the form of head and mouth-structure of a typical *Carabus*, this species differs from all the subgenera and groups of that genus in the simple anterior tarsi of the male. The form of head and thorax and the vertically projecting tooth of the mentum are nearly the same as in *C. kashmirensis* (Koll.) and *C. boysi* (Tatum). The elevated interstitial parts of the elytra bear here and there traces of punctured striæ. The new subgenus necessary for its reception may be thus characterized:—

IMAÏBIUS.

Tarsi antici utroque sexu simplices. Caput post oculos haud incrassatum. Labrum medio valde depresso-emarginatum. Mentum dente magno valde elevato et compresso, apice truncato. Palpi labiales articulo penultimo 5*-setoso; labiales et maxillares articulo apicali in* ♂ *late triangulari, in* ♀ *mediocriter dilatato.*

CARABUS DARDIELLUS.

Quoad formam C. obsoleto *similis, sed paullo gracilior; elongatus, nigro-fuscus, æneascens, parum nitidus; capite (normali oculisque prominentibus) thoraceque vermiculato-strigosis, hoc transverso cordato-quadrato, mox ab angulis anticis rotundato-dilatato paullo post medium vix sinuatim angustato, angulis posticis paullo productis (apice obtusis) declinatis, margine laterali paullo reflexo, antico medio sinuato; elytris elongato-ovatis, postice convexis, striato-punctatis, interstitiis angustis, aut convexis aut planis, utrinque fossulis rotundatis (fundo unigranulatis), triplici serie spatiisque inter fossulas oblongo-tuberculatis, limbo laterali et apicali confertim aspere granulato. Palpi labiales articulo penultimo* 5*-setoso. Antennæ articulo* 4° *apice piloso. Mentum dente magno valde elevato et compresso, apice truncato. Labrum profunde sinuatum.* ♂. *Tarsi antice articulis* 4 *dilatatis, plantis spongiosis,* 1°–3^m *latis et arcte conjunctis,* 4° *parvo.*

Long. 22–24 millim.

Goorais Valley. Many examples.

Resembles *C. boysi* (Tatum) in the sculpture of the elytra; the latter, however, is a much larger species, with less ovate elytra, and differs conspicuously in the subcordate form of the thorax, the sides of which are deeply sinuated near the projecting and acute hind angles. *C. wallichi* (Hope) has a very similarly-formed thorax to *C. boysi*, but the sculpture of the elytra differs from that of both the others in the spaces between the foveæ in the "chain-striæ" being linear and as narrow as the other interstices. I have examined the type specimens of both in the British Museum collection.

The following is a tolerably well-marked variety, of which there are several specimens.

Var. GRANULISPARSUS.

A typo differt solum capite thoraceque dense nec profunde

punctulatis, hoc postice haud sinuatim, subrecte, angustato, elytrisque undique aspere granulatis, interstitiis striarum tuberculisque catenarum crenatis subinterruptis.

NEBRIA HIMALAYICA.

Quoad formam N. picicorni *similis, sed angustior, magis elongata, et valde differt colore omnino nigro nitido, tarsis solum picescentibus. Elongata, elytris parallelis (humeris quadratis), capite post oculos (valde convexos) haud angustato supra transversim depresso lævi; thorace relative parvo, transverso, cordato, mox ab angulis (haud productis) anticis rotundato-dilatato deinde valde angustato, angulis posticis rectis nec exstantibus; sulco anteriore lato profundissimo vage punctato; elytris relative elongatis acute punctulato-striatis, stria 3ª 6–7-punctata, interstitiis parum convexis; subtus lævi, sternis lateribus haud profunde punctatis.*

Long. 12–15 millim. ♂ ♀.

Skardo; Goorais Valley.

BEMBIDIUM (PERYPHUS) BRACCULATUM.

B. cæruleo (*Dej.*) *quoad formam simillimum, paullo minor, thorace basi magis constrictum, antennis dimidio basali, tibiis tarsisque flavo-testaceis, femoribus nigro-fuscis apice flavo-testaceis. Subplanatum, viridi-cyaneum, sulcis frontalibus latis irregulariter impressis; thorace rotundato-cordato prope basin valde angustato, foveis basalibus angustis obliquis profundis carinulaque juxta angulos acutos posticos, basi parce punctato; elytris oblongo-ovatis, versus basin haud angustatis humeris rotundatis, punctato-striatis (stria septima integra sed parum impressa, tertia bifoveata), interstitiis planis, versus humeros macula vaga translucente rufa et margine apicali angustissimo flavo.*

Long. 5–5½ millim.

Goorais Valley.

BEMBIDIUM (PERYPHUS) DARDUM.

Elongatum, mediocriter convexum, thorace relative parvo, rotundato prope basin subtiliter contracto, angulis posticis rectis absque carinula, foveaque lata strigulosa; læte cyaneum, palpis, antennis pedibusque rufo-testaceis; foveis frontalibus postice abbreviatis; elytris elongatis, apice utrinque macula lata indistincta rufescente, punctulato-striatis, stria 7ª distincta sed vix impressa.

Long. 7 millim.

Skardo.

CHLÆNIUS ANCHOMENOIDES.

C. cæruleo (*Stev.*) *proxime affinis; major, nigro-æneus vix cærulescens, partibus oris (cum labro) et antennis fulvo-testaceis, his articulo tertio toto secundoque macula nigris; capite et thorace lævibus politis, hoc relative angusto subcordato postice longe sinuatim angustato, angulis posticis exstantibus acutis, basi*

ruguloso et sparsim punctulato, fovea utrinque oblonga profunda; elytris elongatis et latis profunde punctato-striatis, interstitiis 1°–6ᵐ late impunctatis politis sed prope strias et apicem interstitiisque 7°–9ᵐ toto pluripunctatis et fulvo-pilosis; subtus (ventris segmento apicali lato excepto) lævi polito, lateribus dense punctulatis et pubescentibus. Pedes sat graciles; tarsis subtus dense rigide pilosis, articulo quarto acute emarginato.

Long. 17–18 millim. ♂ ♀.

Goorais Valley.

In size and form this species resembles the *C. noguchii* of Japan. The allied species, *C. cæruleus* (Stev.), a well-known Caucasian Carabid, was also taken in considerable numbers by Mr. Leech.

HARPALUS KASHMIRENSIS.

H. rufitarsi (*Rambur*) *similis, at differt thorace postice adhuc magis angustato vix sinuato. Convexus, niger, politus, elytris in* ♀ *subopacis; palpis, antennis et tarsis rufis; capite quam in* H. rufitarsi *paullo latiore, lævi; thorace mox ab angulis anticis sat late rotundato, postice longe recte et valde angustato, sed angulis posticis distinctis, obtusis, fovea basali angusta parce punctata excepta, lævi; elytris acute et sat profunde æqualiter striatis, interstitiis supra planis, tertio impunctato, cæteris omnino lævibus, apice utroque sexu minus oblique sinuatis.*

Long. 10 millim.

Goorais Valley.

HARPALUS IDIOTUS.

H. tenebroso (*Dej.*) *haud dissimilis, relative brevior, thorace postice paullo magis angustato, elytrisque profundius striatis. Niger, nitidus (elytris in* ♀ *alutaceo-opacis), palpis, antennis tarsisque rufis; capite parvo post oculos angustato, lævi; thorace ante medium leviter rotundato-dilatato, postice recte angustato, angulis posticis obtusis, basi utrinque parce grosse punctato, fovea lata et vage impressa; elytris quam thorax duplo tantum longioribus, oblique sat fortiter sinuatis, acute et profunde striatis, interstitiis, præcipue versus apicem, convexis, tertio unipunctato.*

Long. 10 millim.

Goorais Valley; Skardo.

In colour and sculpture this species greatly resembles *H. kashmirensis*, but the head is much smaller, the neck narrower, and the thorax is less narrowed behind, with angles more nearly approaching a right angle and the base punctured.

MOLOPS PILIFERUS.

Molops piliferus, Bates, Proc. Zool. Soc. 1878, p. 718.

The typical form of this species, as described from a large series of examples taken by Stoliczka at Murree, is remarkable for the uninterrupted series (from base to apex) of large punctures, bearing

each a long, erect hair, in the seventh elytral stria, and for the strongly cordate-quadrate thorax and flat elytral interstices. Numerous individuals perfectly agreeing with the Murree form were taken by Mr. Leech in the Goorais Valley, but mingled with examples in which the piliferous punctures are much less numerous, the elytral interstices convex, and the thorax more quadrate than cordate. The extreme form departs so much from the type that had there not been a graduated series of intermediate examples, it might be considered a distinct species.

Var. M. depilatus. *Plerumque minor, nigerrimus, nitidus; thorace antice mediocriter rotundato, postice minus sinuatim angustato, angulis posticis paullo exstantibus, interdum rectis; elytris profunde striatis, interstitiis convexis, 8vo parum angustato striaque 7ma postice solum pauciter pilifero-punctata.*

Long. 11–13 millim.

Goorais Valley; Skardo.

PRISTONYCHUS KASHMIRENSIS.

C. cimmerio (*Dej.*) *quoad formam subsimilis. Apterus, niger,* (♂ ♀) *sericeo-opacus, capite thoraceque nitidioribus, antennis basi nigris, palpis tarsisque rufo-piceis; capite lævi postice angustato, genis elongatis parum prominentibus; thorace perparum cordato ante medium leviter rotundato-amplinto, deinde usque ad basin subrecte angustato, angulis posticis fere obtusis, margine postico alte reflexo, supra passim vage transversim strigoso; elytris convexis ovatis interdum postice dilatatis, ad humeros angustis, convexis, acute striatis, striis subtilissime punctulatis, interstitiis fere planis. Prosternum apice deflexum, rotundatum. Trochanteres postici obtusi. Tibiæ omnes rectæ. Tarsi supra sparsim setifero-punctati, subtus posteriorum articulo primo parce piloso, unguiculis basi denticulatis; tarsi antici* ♂ *articulis tribus dilatatis subtus squamulatis.*

Long. 16–18 millim. ♂ ♀.

Goorais Valley.

The thorax varies much in outline, in extreme cases it is rather strongly narrowed behind with the sides sinuated and hind angles slightly projecting and acute.

PRISTODACTYLA LACERANS.

Quoad formam P. leni (*Mannh.*) *similis. Elongatus, nigro-nitidus; antennis, palpis, tibiis et tarsis picescenti-rufis; capite* (*cum oculis*) *anguste ovato lævi; thorace subquadrato, antice usque ultra medium leviter rotundato-dilatato, prope basin mediocriter sinuato-angustato, angulis posticis rectis subacutis, intra angulum incrassato, ibique puncto setigero; foveis latis* (*interdum profundis*) *lævibus; elytris fere parallelis, mediocriter convexis, apice vix perspicue sinuatis, basi utrinque valde arcuata, acute striatis, striis subtilissime haud profunde punctulatis, interstitiis parum convexis, tertio versus apicem unipunctato* (*interdum impunctato*). *Tarsi subtus longe pilosi, 4 posticis lateraliter sulcu-*

latis, unguibus valde pectinatis; anteriores ♂ articulis 3 dilatatis late cordatis æqualibus. Prosternum immarginatum; episterna postica brevis. Mentum dente bifido.

Long. 11 millim.

Goorais Valley.

ANCHOMENUS (AGONUM) MESOSTICTUS.

A. pusillo (*Schaum*) *simillimus et affinis, sed differt thorace postice paullulum rectius angustato angulisque distinctis obtusissimis foveaque latiore minus impressa rugulosa et sparse punctata. Subæneo-niger, nitidus, antennis usque ad basin nigris, tarsis palporumque apice solum rufescentibus; elytris magis quadratis, fortius punctulato-striatis, interstitiis convexiusculis, tertio in medio grosse punctato. Antennæ articulis 1°–3^m^ nudis. Tarsi omnes dorso canaliculati medioque carinati, articulo quarto latiusculo cordato.*

Long. 8 millim.

Goorais Valley.

COLPODES MELITTUS.

C. ovalicipiti (*Bates*[1]) *proxime affinis et similis, sed differt elytris viridi-æneo nitentibus nec chalybeis; antennis, palpis, tibiis tarsisque melleo-flavis (interdum sordide fulvis). Caput anguste ovatum, oculis haud prominentibus colloque transverse depresso; thorace plerumque longiore et angustiore quam in* C. ovalicipiti, *cordato-ovato, ante medium (rarius prope medium) latiore, deinde usque ad angulos posticos valde obtusos subrecte angustato; elytris breviter oblongo-ovatis, apice haud perspicue sinuatis acute striatis, interdum punctulatis. Episterna postica paullulum elongata. Tarsi 4 posteriores dorso bisulculati, 2 anteriores sulculis obsoletis; articulo quarto in anticis profunde, in posticis parum emarginato, longe piloso.*

Long. 10 millim.

Goorais Valley.

COLPODES EULABES.

C. melitto *quoad formam et colorem similis, sed differt capite latiore, oculis prominentibus, tarsis lateraliter sulculatis, articulo quarto bilobato, elytrisque apice sat valde sinuatis. Niger, nitidus, elytris viridi-æneo nitentibus; palpis, antennis, genubus, tibiis, tarsis et trochanteribus testaceo-rufis; capite pone oculos multo citius angustato, collo transversim depresso; thorace brevi, transverso, cordato, postice valde angustato, lateribus postice reflexis angulisque elevatis subrotundatis. Episterna postica sicut in* C. melitto *paullulum elongata.*

Long. 10–11 millim.

Goorais Valley.

[1] P. Z. S. 1878, p. 719.

6. On new Species of the Coleopterous Families *Cicindelidæ* and *Carabidæ*, taken by Mr. Pratt in Chang Yang, near Ichang on the Yang-tsze, China. By H. W. Bates, F.R.S.

[Received March 18, 1889.]

The following descriptions are in continuation of those published in the Society's 'Proceedings,' 1888, pp. 380–383. The specimens form part of the second collection sent home by Mr. Pratt, made in the richly-wooded hilly district of Chang Yang, at elevations of from 4000 to 6000 feet above the sea-level.

Collyris aureofusca.

C. filiformi (*Chaud.*) *affinis : gracilis, postice gradatim sed paullo dilatata, supra æneo- vel violaceo-fusca, elytris aurato-fuscis ; labro antennisque basi æneseenti-nigris, his articulis 3°–11^m^ plus minusve fulvo-testaceis, mediocribus, thoracis basin longitudine attingentibus ; capite post oculos, ♂ rotundato-angustato, ♀ convexiore cuboidali, fronte dimidio anteriore medio distincte sed obtuse carinata ; thorace subconico post medium mediocriter et gradatim dilatato, ante basin sulcato-constricto, dorso transversim striato ; elytris politis, sat minute et discrete (medio paullulum rugose) punctatis, basi et apice fere lævibus, medio utrinque fasciola parum distincta (interdum obsoleta) rufescenti ; subtus nigro-cyanea, pedibus fulvo-piceis, femoribus posticis piceis (♀ femoribus et tibiis posticis piceis, tarsis fulvis).*

Long. 13–16 millim.

This species is most nearly allied to *C. formosana* (Bates), described in Proc. Zool. Soc. 1866, p. 341, in which the frontal carina is also somewhat abruptly elevated.

Carabus (Coptolabrus) principalis.

Elongatus, elytris (♂ ♀) valde convexis apiceque longe acute productis ; capite postice thoraceque læte rufo-auratis parum nitidis, elytris obscure smaragdinis opacis, limbo laterali splendide rufo-aurato ; antennis partibus oris, corpore subtus pedibusque subviolaceo-nigris, prosterno cupreo-aurato elytrisque epipleuris viridi-auratis ; capite postice thoraceque creberrime confluenter punctulatis, hoc paullo ante medium angulatim dilatato, lateribus antice leviter rotundatis postice valde sinuatis ; margine laterali æqualiter reflexo, angulis anticis a collo paullulum remotis, posticis (cum margine basali contiguo) subito deflexis ; elytris tuberculis ovatis mediocribus, valde convexis, utrinque seriebus tribus, granulisque rotundis confertis seriebus quatuor, nigris nitidis ; interstitiis subtilissime alutaceis opacis, irregulariter minute granulatis ; prosterno sparsissime punctulato.

Long. 33–42 millim. ♂ ♀.

Ichang.

Of the now numerous species of *Coptolabrus* this beautiful insect in sculpture and colours approaches nearest *C. elysii* (Thoms.). But it is conspicuously distinguished from that species by the very convex, ovate and distant, primary tubercles, and the minutely granulated and opaque depressed parts of the elytra. In the spiniform apices of the elytra it much resembles *C. cœlestis*, from which it differs so greatly in elytral sculpture. The elytra are very convex and elongate-ovate in both sexes, though broadest in the female.

CARABUS (COPTOLABRUS) PUSTULIFER.

Carabus (*Coptolabrus*) *pustulifer*, Lucas, Ann. Soc. Ent. Fr. 1867, et 1872, p. 293, t. 14. fig. 12.

In the same collection is a single example of a fine colour-variety of this remarkable species, which is distinguished by the great elevation of the elytral primary tubercles, and the sinuous close rows of the secondary rows, or granules. The specimen agrees very closely with the above-cited descriptions as to form and sculpture, but differs in colours, the head and thorax being dull golden coppery and the depressed parts of the elytra dark emerald-green, the typical form, as described by Lucas, being violaceous black.

CARABUS (COPTOLABRUS) LONGIPENNIS.

Carabus (*Coptolabrus*) *longipennis*, Chaudoir, Ann. Soc. Ent. Fr. 1863, p. 449.

Mr. Pratt has sent home several examples of both sexes of a species which agrees well with Chaudoir's description, especially as regards the peculiar form of the thorax and the sculpture. Chaudoir's typical example came from Northern China, and his species has since been generally identified with *C. smaragdinus*, Eschscholtz, from the Amur and Manchuria. Our species is certainly different from *C. smaragdinus*, and is more nearly allied to *C. elysii*, with which Chaudoir compared his *C. longipennis*.

CARABUS TIENTEI, var. MINOR.

Carabus tientei, Thoms. Archiv. Entom. i. p. 165.

Mr. Pratt's examples from Ichang are smaller than those he previously obtained at Kiukiang, *i. e.* 27–30 millim. as compared with 37 millim., and have two instead of three nearly entire elytral interstices exterior to the third chain-stria. In all other respects they agree with the type form, in both sexes. The following is either a variety or an aberration :—

C. ICHANGENSIS. *Differt a var.* minore *solum elytrorum interstitiis 1° et 3° (inter strias catenatas) interruptis vel in parte obsoletis.* ♂.

CARABUS PROTENES.

C. tientei *affinissimus, sed conspicue differt corpore graciliore elytrisque in* ♀ *apice haud dentatis. Valde elongatus et angustus, ænescenti-niger, subnitidus ; capite thoraceque fere lævibus, hoc*

elongato, ante medium leviter rotundato-dilatato antice sensim angustato, subtilissime corrugato fere lævi; elytris sicut in C. tientei *acute punctulato-striatis, striisque catenatis utrinque tribus et interstitiis tribus integris exterioribus, apice* (♂ ♀) *oblique sinuatim truncatis; corpore subtus lævissimo.* ♂. *Tibiæ anticæ intus simplices; tarsi articulis* 4 *subtus spongiosis.*

Long. 26–30 millim.

Ichang. A good series of examples.

PRISTODACTYLA AGONOÏDES.

Taphriæ nivali (*Panz.*) *haud dissimilis, sed thorace minore et angustiore. Fusco-nigra, nitida, thoracis margine laterali, palpis, antennis pedibusque rufescentibus; capite anguste ovato lævi; thorace parvo anguste ovato sat convexo polito, postice magis quam antice angustato, angulis posticis fere rotundatis, foveis angustis; elytris anguste ovatis, apice haud sinuatis, convexis acute striatis, interstitiis parum convexis, 3° postice unipunctato; pedibus minus elongatis, tarsis* 4 *posterioribus articulis* 1° *et* 2° *extus versus dorsum oblique sulcatis, unguibus dimidio basali longe pectinatis. Prosternum lateribus tantum marginatum, apice lævi.*

Long. 7½ millim.

Ichang.

LEBIA PRATTIANA.

L. fuscæ (*Morawitz*) *similis, sed multo major et valde differt thorace antice usque ad collum rotundato-angustato;* L. xanthophanæ (*Bates*) *magis affinis. Oblonga, postice paullo dilatata, fusco-nigra, polita; partibus oris, antennis pedibusque obscure rufo-testaceis, femoribus apice plus minusve fuscis; capite rugoso et sparsim punctulato; thorace transverso a medio usque ad collum rotundato-angustato, angulis anticis nullis, postice vix angustato, angulis posticis paullulum obtusis, lobo basali brevissimo, dorso transversim ruguloso, lateribus late explanatis et alte reflexis; elytris acute punctulato-striatis, interstitiis convexis, 3° bipunctato, apice flexuoso-truncatis, angulis externis breviter dentatis. Tarsi articulo 4° longe bilobato, unguibus 8° et 9° pectinatis. Venter versus apicem punctulato-pubescens.*

Long. 12 millim.

This species connects the Asiatic group of *Lebia*, in which the thorax is wholly rounded anteriorly (without anterior angles) and the outer angle of the elytral truncature dentiform, with the numerous group iv. β of Chaudoir's Monograph of the Lebiides, in which the elytral interstices are similarly convex, but the outer angle of the truncature rounded &c. *L. prattiana*, in fact, resembles much a large *L. caligata* (Bates).

LEBIA XANTHOPHANA.

Lebia xanthophana, Bates, Proc. Zool. Soc. 1888, p. 382.

Mr. Pratt has sent a numerous series of this species from Ichang,

nearly all of which have the elytra and the greater part of the under surface black (var. *nigrans*), which seems to be the prevailing form of the species; the pale yellowish form (described as *L. xanthophæa* from a single example) being therefore a variety.

LEBIA CALLITREMA.

L. comitatæ (*Bates*) *ex Japoniâ proxime affinis et similis. Flavo-testacea, elytris vitta suturali postice sensim vel subito dilatata, paullo post scutellum incipienti et ante apicem terminata, nigra, strigaque abbreviata apud interstitium 8vum infuscata; capite lævi; thorace mediocriter transverso ab angulis anticis rotundato-ampliato, postice vix perspicue angustato (lateribus levissime sinuatis), angulis posticis rectis, margine laterali late explanato-reflexo, lobo basali mediocriter elongato, dorso vage sed distincte strigoso; elytris profunde striatis interstitiisque convexis. Tarsi articulo 4° anguste bilobato.*

Long. 6 millim.

April 16, 1889.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary exhibited a pair of a fine large Buprestine Beetle of the genus *Julodis* (*Julodis ffinchi*, Waterh.) (see P. Z. S. 1885, p. 64), of which a single specimen had been previously transmitted by Mr. B. T. Ffinch, C.M.Z.S., in 1884, from Karachi.

These specimens, likewise transmitted to the Society by Mr. Ffinch, had been obtained in the same locality. The previous specimen was a female. The male was similar but narrower and smaller. It was proposed to deposit the specimens, in Mr. Ffinch's name, in the British Museum.

The Secretary also exhibited a specimen of an Insect transmitted by Mrs. Talbot, wife of Major Talbot, Consul General of Bagdad. Mrs. Talbot wrote that this was a very destructive insect which abounds at Bagdad, and was called by the native gardeners "Harub." It was seldom seen above ground and made long burrows, throwing up the earth in ridges all over the garden and destroying a considerable number of young plants.

Mr. C. O. Waterhouse, to whom Mr. Sclater had submitted the specimen, pronounced it to be the common Mole-cricket of Europe, *Gryllotalpa vulgaris*.

Mr. Sclater made some remarks on the animals noticed in the Zoological Gardens of Rotterdam, Amsterdam, and Antwerp, which he had recently visited.

In the Rotterdam Gardens, on a row of trees immediately adjoining the large covered Aviary in which the Night-Herons bred,

a colony of wild Herons (*Ardea cinerea*) had lately established itself, and now numbered 24 pairs.

In Amsterdam Mr. Sclater was much interested to find an adult male and a young female of the fine Antelope *Tragelaphus gratus*, described by him in the Society's 'Proceedings' for 1883 (see P. Z. S. 1883, p. 34, pl. viii.), remarkable for its long extended hoofs. These animals were named in Amsterdam *Tragelaphus decula*, but were certainly not, in Mr. Sclater's opinion, *Antilope decula* of Rüppell (Neue Wirb. i. p. 11, t. iv.). They had been received from a correspondent on the Lower Congo. Other fine species represented in the Amsterdam Gardens were *Canis jubatus* of Brazil, *Pedetes caffer* of South Africa, *Felis servalina*, Ogilby (*cf.* Sclater, P. Z. S. 1874, p. 495, pl. lxiii.), from the Congo, and *Corythaix livingstoni*, G. R. Gray.

Mr. Sclater had also paid a visit to the private garden of Heer Blauuw, at Westervald, near Hildersum, and inspected with great pleasure the herd of Gnus (*Catoblepas gnu*) recently spoken of by that gentleman in a communication to this Society (*suprà* p. 2), and the other beautiful specimens in that collection.

Mr. E. T. Newton, F.Z.S., exhibited a tibio-tarsus of the large extinct bird *Gastornis klaasseni* from the Woolwich Beds of Croydon. The specimen had parts preserved in it which were wanting in the type (described, Trans. vol. xii. p. 143), and consequently the length of the bone was now made certain.

The following papers were read:—

1. Remarks on the Zoo-geographical Relationships of the Island of Palawan and some adjacent Islands. By A. H. Everett, C.M.Z.S.

[Received March 15, 1889.]

(Plate XXIII.)

It has been customary heretofore to regard the Island of Palawan, together with Balabac and the numerous smaller islands which lie between South Balabac and the Mindoro Straits, as forming a kind of debatable land, of which the fauna was not sufficiently well known to allow of its being allocated definitely to the Philippines or to Borneo and the more typical sub-area of the Indo-Malayan Sub-Region. But in actual practice these islands have been treated as a part of the Philippine sub-area by the authors who have written on the zoology of the latter, though until lately this practice was followed simply for reasons of convenience, and not as expressing the opinion that their natural zoo-geographical relationship lay with that group rather than with Borneo.

Quite recently, however, Professor J. B. Steere, to whom we are

A MAP OF
PALAWAN
AND ADJACENT ISLANDS.
Scale of English Miles
Soundings in fathoms
Heights in feet
Localities at which collections of Birds have been made are underlined with red.
CALAMIANES
Calamian or Culion
Busuanga
MINDORO
CUYOS ISLANDS
Cuyo I.
Karlandagan Is.
Dumaran
Tuitai Is.
St Paula B.
100 fathom line

P.Z.S. 1889. PL. XXIII.

indebted for our first acquaintance with the fauna of the islands in question, has given formal expression, in a prominent scientific journal[1], to the view that Palawan and Balabac should be considered as constituting, zoologically, a part of the Philippine Archipelago. Prof. Steere, having proceeded to divide the Philippine "Province" of the Indo-Malayan Sub-Region into six "Sub-Provinces," of which the sixth or Western Sub-Province "includes Balabac, Palawan, and perhaps the Calamianes," goes on to state that "this Sub-Province has evidently received a large portion of its fauna from North Borneo, through Balabac, at a comparatively recent date, and since its separation on the north from the rest of the Philippines, so that these genera have not flowed over into Mindoro and Luzon. In addition to these apparently late arrivals from Borneo, the Sub-Province possesses a large number of peculiarly Philippine birds and mammals, which show it to be an integral part of the province." So that it would seem from the above extract that, in Prof. Steere's opinion, the fundamental characteristics of the fauna of the Palawan group of islands are Philippine rather than Bornean, although there has been a comparatively more recent and very considerable invasion of Bornean forms; and the group is thus for the first time pronounced to be zoo-geographically, as it is politically, an integral portion of the Philippine sub-area.

With this view I do not find myself able to concur, and it seems to me that such evidence as is available on the subject indicates rather that Palawan and the other islands mentioned by Prof. Steere have never been directly connected with any part of the Philippines since the former received their existing population, but that they have been almost certainly so connected with Borneo, or, more correctly perhaps, with a south-eastern extension of continental Asia, of which Borneo formed a part. It appears to me that it was from the Bornean side that these islands received their original fauna, and that the Philippine element is the foreign element and the one of comparatively recent advent. As it is very desirable that the natural relationship of the Palawan group should be placed on an established footing as soon as possible, I propose to offer briefly for consideration the grounds which seem to me to justify the definite inclusion of these islands in the western sub-area of the Indo-Malayan Sub-Region.

A glance at the accompanying map of the Palawan group (Plate XXIII.) demonstrates at once that these islands, together with Cagayan-Sulu and Sibutu (which have been also looked upon as zoologically Philippine until recently), are all intimately connected with Northern Borneo by a very shallow submarine bank, the depth of the sea on which is generally less than 50 fathoms, and nowhere exceeds 100 fathoms continuously through the straits intervening between the China and Sulu seas. At the 100-fathom limit the bed of the ocean abruptly plunges down to depths ascending, in the Mindoro and Sibutu straits, 500 fathoms, and in the Sulu sea 1900 fathoms, thereby forming a profound gulf, which completely severs all the islands above mentioned from any connexion with the Philip-

[1] 'Nature,' Nov. 1888, pp. 37, 38.

pines. The significance of such a condition of things in the submarine geography of the area between Borneo and the Philippines is too well understood to render it necessary to enlarge upon it here; and if the settlement of the point at issue depended upon considerations of physical geography alone, it would probably be at once conceded by all that to include the Palawan group as an integral part of the Philippine sub-area is to draw a purely arbitrary line of delimitation somewhere through the Balabac straits and to the westward of Cagayan-Sulu and Sibutu, instead of adopting the natural boundary which soundings demonstrate to exist already in the Mindoro and Sibutu straits.

But the geographical evidence for the connexion here advocated, though valuable in so far as it shows that a very slight elevation of the sea-bed would suffice now, and may have sufficed in the past, to join the Palawan group to Borneo, while one of considerable magnitude would be required to effect a junction with the Philippines, is not of convincing weight unless it can be shown that it is confirmed by the characteristic features of the Palawan fauna. For if we were to rely on the argument of physical geography alone, we should be confronted with the fact that Celebes might just as well be regarded as having been directly connected in recent geological time with Borneo, since that island also is apparently linked to the latter by a broad band of submarine bank, on which the soundings are everywhere, so far as is ascertained, less than 100 fathoms. And as this argument might be advanced, and this bank in the Straits of Macassar is a real difficulty, in view of the extreme dissimilarity of the faunas on either side of that strait, I may be permitted to digress for a moment before proceeding to examine the Palawan fauna, and to point out that in consequence of local circumstances, which are absent in the case of Palawan, this apparent evidence of a recent land-connexion between Borneo and Celebes is susceptible of being otherwise interpreted. The interpretation has been suggested by Mr. Wallace, who remarks[1]: "The southern portion of the Straits of Macassar is full of coral reefs, and a shallow sea of less than 100 fathoms extends from Borneo to within about 40 miles of the western promontory of Celebes; but farther north there is deep water close to the shore, and it seems probable that a deep channel extends quite through the straits, which have no doubt been much shallowed by the deposits from the great Bornean rivers as well as by those of Celebes itself. Southward, again, the chain of volcanic islands from Baly to Timor rise out of a deep ocean, the few soundings we possess showing depths of from 670 to 1300 fathoms almost close to their northern shores. We seem justified therefore in concluding that Celebes is entirely surrounded by a deep sea, which has, however, become partially filled up by river-deposits, by volcanic upheaval, or by coral reefs. Such shallow seas, where they exist, may therefore be due to antiquity and isolation, instead of being indications of a former union with any of the surrounding islands." The rainfall in Borneo is enormous, and the country is largely made

[1] 'Island Life,' p. 423.

up of soft decomposable rocks which are readily degraded by denudational agencies; and no one who has watched the larger rivers of the island incessantly discharging their yellow mud-laden floods seawards will be disposed to doubt that they must have done much towards shallowing of the Macassar strait. But this agency cannot be called in to explain the existence of the shallow bank connecting Borneo with the Palawan group; for all the rivers discharging on to this bank are of quite insignificant size, and therefore it may be regarded as having formed for some time past a permanent feature in the local geography, whereas the Macassar bank is a recent feature still in process of construction. The Palawan bank may have been, and almost certainly has been, submerged far below its present level; but the probability is equal that it has also been elevated into dry land and a temporary junction formed—perhaps more than once—with Borneo.

Proceeding now to inquire what light is thrown upon the connexion of Palawan with Borneo on the one side or the Philippines on the other by the characteristics of the fauna of the Palawan group, we are met with the difficulty that the only classes of animals from these islands which are fairly well known are the mammals and the birds. On the other hand evidence derived from the distributional relationships of these two classes has admittedly a high value for the purpose in view. The mammals which are known to exist in the Palawan group are the following :—

1. *Macacus cynomolgus* ...	Common to Philippines and Indo-Malaya proper.
2. *Felis minuta*	Indo-Malaya Proper and I. of Negros.
3. *Paradoxurus philippensis*	Common to Philippines and N. Borneo.
4. *Arctictis binturong*	Nepal to Borneo.
5. *Herpestes brachyurus* ...	Malay Peninsnla and Borneo.
6. *Mydaus*, sp. (?)[1]	Sumatra, Java, and N. and E. Borneo.
7. *Lutra*, sp.	Genus abundant in N. Borneo.
8. *Tragulus javanicus*	Indo-Malaya Proper and I. of Balabac.
9. *Sus*, sp.	Genus common to Philippines and Borneo.
10. *Sciuropterus alboniger* ...	Nepal to Cambodja.
11. *Sciurus steerii*	Allied to *S. ferrugineus* of Assam, Burmah, and Siam.
12. *Mus*, sp.	Genus common to Philippines and Borneo.
13. *Hystrix pumila*	Genus abundant in N. Borneo.
14. *Tupaia javanica*	Indo-Malaya Proper. Abundant in Borneo.
15. —— *ferruginea*	Indo-Malaya Proper. Abundant in Borneo.
16. *Pteropus hypomelanus* ...	Philippines, Borneo, Celebes, and N. Guinea.
17. *Kerivoula hardwickii* ...	India, Java, Borneo.
18. *Manis*, sp.	Genus very abundant in N. Borneo.

The above enumeration shows that the Palawan group possesses a mammalian fauna (exclusive of Bats) comparable in variety of species and genera with that of the entire Philippine Archipelago. Of the species composing this fauna only one, the Paradoxure, namely, can be regarded as a distinctively Philippine species, and even that one occurs also in Northern Borneo. The remaining mammals, after putting on one side those which are common to the Philippines and

[1] This animal has never been actually obtained, I believe, by any collector, but it has frequently been described to me by Europeans as well as by natives.

Borneo, are all identical with or allied to species inhabiting the latter island or other parts of Indo-Malaya proper. Not one of the few mammals which are peculiar to the Philippines is known to occur in the Palawan group. On the other hand the genera *Hystrix*, *Manis*, and *Mydaus*, which are such as require a continuous land-connexion to enable them to migrate from one area into another, and which are all very abundantly represented in Northern Borneo, do occur in Palawan, while none of them have been recorded as existing in the Philippines. So that a study of the relationships of the mammals of the Palawan group seems to show that this portion of the fauna was derived from Borneo and western Indo-Malaya and not from the Philippines; and not only so, but that continuous connexion by land with Borneo must have existed so as to enable some of the genera which we find in Palawan to have reached that island. It may be argued that had such continuity of land-surface existed within the lifetime of the present fauna, the mammals of Palawan could not fail to be far more numerous than is known to be the case. But the actual junction may have been of too brief duration to allow of the migration of a large number of species; or, as is far more probable, the mammals were at one time sufficiently numerous, and they have since been almost extinguished by a general submergence of the Palawan group. There is reason to believe that the Island of Borneo has undergone in comparatively recent times a submergence to a depth of probably not less than 1000 feet, from which it is now recovering; and since Palawan appears to be partaking in the present elevatory movement, it is reasonable to conjecture that it partook also in a less or greater degree of the preceding subsidence, in which case the group must have been reduced to a chain of steep islets affording no scope for the continued existence of a varied mammalian fauna.

Passing now to the birds, we find that the total number of species authentically recorded from the Palawan group amounts to 161 [1], which may be tabulated as follows.

TABLE I.—Showing the Palawan Species which are common to Borneo or other parts of western Indo-Malaya and to the Philippines, together with the Species which are of wide general distribution or are migrants from Continental Asia.

1. Phylloscopus borealis
2. Acrocephalus orientalis.
3. Monticola solitaria.
4. Cisticola cisticola.
5. Motacilla flava.
6. Anthus maculatus.
7. —— gustavi.
8. Pericrocotus cinereus.
9. Lalage terat.
10. Hemichelidon sibirica.
11. Musicapa griseisticta.
12. Hypothymis occipitalis.
13. Culicicapa ceylonensis.
14. Hirundo gutturalis.
15. —— javanica.
16. Sturnia violacea.
17. Artamus leucorhynchus.
18. Chætura gigantea.
19. Collocalia fuciphaga.
20. Eurystomus orientalis.

[1] I exclude *Parus elegans*, because the accuracy of the Palawan locality is very doubtful, and *Turnix raynaldi*, which Mr. Ogilvie-Grant assures me is identical with *T. nigrescens*.

TABLE I. (continued).

21. Alcedo bengalensis.
22. Halcyon chloris.
23. Cuculus canorus.
24. Hierococcyx strenuus.
25. Cacomantis merulinus.
26. Circus spilonotus (?).
27. Astur trivirgatus.
28. Butastur indicus.
29. Haliaetus leucogaster.
30. Pernis ptilonorhynchus.
31. Falco communis.
32. —— severus.
33. Pandion haliaetus.
34. Fregata minor.
35. Ardea sumatrana.
36. Herodias intermedia.
37. Bubulcus coromandus.
38. Butorides javanica.
39. Gorsachius melanolophus.
40. Chalcophaps indica.
41. Calœnas nicobarica.
42. Carpophaga ænea.
43. —— bicolor.
44. Treron vernans.
45. Ptilopus melanocephalus.
46. Megapodius cuningi.
47. Gallus bankiva.
48. Excalfactoria chinensis.
49. Rallina fasciata.
50. Erythra phœnicura.
51. Œdicnemus magnirostris.
52. Glareola orientalis.
53. Charadrius fulvus.
54. Squatarola helvetica.
55. Eudromias vereda.
56. Ægialitis geoffroyi.
57. —— mongolica.
58. —— dubia.
59. —— cantiana.
60. —— peroni.
61. Strepsilas interpres.
62. Gallinago megala.
63. Limicola platyrhyncha.
64. Tringa subminuta.
65. —— ruficollis.
66. Tringoides hypoleucus.
67. Totanus calidris.
68. —— brevipes.
69. —— glareola.
70. Terekia cinerea.
71. Numenius lineatus.
72. —— variegatus.
73. Sterna bergii.
74. —— melanauchen.
75. Anous stolidus.

TABLE II.—Showing the Palawan Species which are identical with or allied to Species inhabiting the Philippines, Sanghir, Celebes, &c., but which are not found in Borneo or western Indo-Malaya, except as migrants or stragglers. Species peculiar to the Palawan group are distinguished by the prefix of a dagger.

†1. Oriolus palawanensis.
†2. Parus amabilis.
3. Lanius luzoniensis.
†4. Chibia palawanensis.
5. Rhipidura nigritorquis.
†6. Zeocephus cyanescens.
7. Culicicapa panayensis.
†8. Siphia lemprieri (*S. ramsayi*).
†9. Æthopyga shelleyi.
10. Cinnyris sperata.
†11. —— aurora.
12. Myzanthe pygmæa.
13. Oxycerca everetti.
14. Calornis panayensis.
15. Corone philippina.
16. Pitta atricapilla.
17. Pitta erythrogastra (*P. propinqua*).
18. Collocalia troglodytes.
?19. Caprimulgus manillensis.
†20. Chrysocolaptes erythrocephalus.
21. Pelargopsis gouldi.
22. Eudynamis mindanensis.
23. Cacatua hæmaturopygia.
†24. Prioniturus cyaniceps.
25. Tanygnathus luzoniensis.
26. Scops everetti (*S. fuliginosa*).
27. Spizaetus philippensis.
28. Turtur dussumieri.
29. Macropygia tenuirostris.
30. Ptilopus lechlancheri.
31. Turnix nigrescens.

TABLE III.—Showing the Palawan Species which are identical with or allied to Species inhabiting Borneo or western Indo-Malaya, but which are not found in the Philippines except as migrants or stragglers. Species peculiar to the Palawan group are distinguished by the prefix of a dagger.

†1. Cittocincla nigra.
2. Orthotomus cuticeps.
†3. Mixornis woodi.
†4. Turdinus cultrirons.
†5. Ptilocichla falcata.
†6. Anuropsis emereiceps.
†7. Iole striaticeps.
8. Micropus melanocephalus.
†9. Criniger feater.
†10. —— palawanensis.
†11. Pycnonotus cinereifrons.
12. Ægithina viridis.
†13. Chloropsis palawanensis.
†14. Irena tweeddalii.
15. Oriolus xanthonotus.
16. Dendrophila frontalis.
†17. Hyloterpe whiteheadi.
18. Buchanga leucophæa (?).
19. Artamides sumatrensis.
20. Pericrocotus igneus.
21. Cryptolopha montis.
22. Siphia hanyumas.
†23. —— erithacus.
24. Chalcostethus insignis.
25. Anthreptes malaccensis.
†26. Arachnothera dilutior.
†27. Prionochilus johannæ.
28. Munia atricapilla.
†29. Eulabes palawanensis.
†30. Corone pusilla.
31. Batrachostomus cornutus.
32. Caprimulgus macrurus.
33. Mulleripicus pulverulentus.
†34. Thriponax hargitti.
†35. Tiga everetti.
36. Alcedo asiatica.
37. Ceyx rufidorsa.
38. Halcyon coromanda.
39. —— pileata.
†40. Anthracoceros lemprieri.
41. Cuculus sonnerati.
42. Surniculus lugubris.
43. Chrysococcyx xanthorhynchus.
44. Eudynamis malayana.
†45. Dryococcyx harringtoni.
46. Centrococcyx javanensis.
47. —— curycercus.
48. Ninox scutulata.
†49. Syrnium whiteheadi.
50. Spizaetus limnaetus.
51. Spilornis bacha.
†52. Baza leucopias.
53. Turtur tigrina.
54. Treron nasica.
†55. Polyplectron napoleonis[1].

A consideration of the foregoing tables reveals the facts: (1) that the only two *genera* of birds which are confined to the Palawan group, namely *Dryococcyx* and *Ptilocichla*, are allied to genera belonging to the typical Indo-Malayan and not to the Philippine sub-area; (2) that the preponderance of the *species* belonging to the former sub-area over those belonging to the latter is as 55 to 31, and (3) that whereas of the 31 Philippine species only 9 have varied and become distinct forms confined to the Palawan group, no fewer than 24 of the 55 Bornean and western Indo-Malayan species have thus varied, the variation being also, as a general rule, more pronounced in character than is the case with the Philippine species. From these facts it is apparent that not only has a larger proportion of the existing Indo-population entered the Palawan group from Borneo or the Asiatic mainland than has entered it from the Philippines, but that the Bornean element represents the fundamental stock, while (3) it is markedly higher degree of differentiation, which is [illegible] indicative of its greater antiquity and longer [illegible]

[illegible] the Indian fauna of Palawan as far as is known, [illegible] have already arrived at by our

[illegible] but this locality is probably erroneous.

inquiry into the physical geography of the group and the relationship of the mammalian fauna; and they appear to me to be, when taken together, of sufficient weight to justify the inclusion of these islands definitely as an integral portion of the Bornean group in the western sub-area of Indo-Malaya, and this notwithstanding the probability that future research may show that in some classes of animals the Philippine element preponderates, and that many of the small low islets immediately confronting the Philippines on the eastern margin of the Bornean bank, such as the Cuyos, no longer retain any trace of their original western element.

If the origin of the Palawan fauna here suggested be the true one, then the highlands which are still wholly unexplored, and which attain to an elevation of between 6000 and 7000 feet, will probably be found to exhibit a yet more marked predominance of Bornean forms than is presented by the low country.

The islands of Cagayan-Sulu and Sibutu, which have been treated, like Palawan, as belonging to the Philippines, should be regarded similarly as natural component portions of the Bornean group. They are both situated on the edge of the fringing submarine bank of north-eastern Borneo. The first named has been visited by Dr. Guillemard, who obtained a small collection of the birds, comprising 15 species, and who pointed out[1] that, judging from the position of the island and the character of its avifauna, it should be regarded as related to the Bornean instead of, as heretofore, to the Philippine group. The only peculiar species obtained was *Mixornis cagayanensis*, a representative form of *M. borneensis*. The Island of Sibutu has never been visited by a naturalist, and although of small extent it is of interest in view of its close proximity to the southern extremity of the Philippine Archipelago. Dr. Guillemard, again, was the first to show[2] that this island should probably be considered as an outlying portion of Borneo; and as his remarks contain all the information about it, I cannot do better than quote them, premising that the Tawi-Tawi Islands, of which, in political geography, Sibutu is one, form the south-western extension of the Sulu Archipelago, which is admittedly Philippine in the character of its fauna. Dr. Guillemard says:—"West of Tawi-Tawi the level of the sea-bottom completely changes, depths of 100 fathoms or more being obtained close in-shore, while in the fairway of the Strait (the Sibutu Passage) Captain Chimmo was unable to get bottom at 500 fathoms. The distance across the Strait is about 18 miles, and the surveys hitherto made seem to show an equally precipitous slope of the eastern banks of Sibutu Island. We are at present without exact information as to the soundings between Sibutu and Borneo, one point of which, Tanjong Labian, is distant only 20 miles; but as many islets, reefs, and sand-cays are known to intervene, it is almost certain that they are not of any great depth. This Sibutu Passage thus seems to be the natural delimitation of the Philippine Archipelago, and though of the only two species (of birds) obtained, or said to have been obtained, from

[1] P. Z. S. 1885, p. 418. [2] P. Z. S. 1885, p. 250.

Sibutu I., *Oriolus chinensis* and *Sarcops calvus*, the latter at least is purely Philippine, I cannot help thinking that a more extended knowledge of its avifauna would probably show a preponderance of western rather than eastern species."

In concluding this sketch of the grounds upon which I am induced to consider Palawan and the other islands above mentioned as component parts, from a zoo-geographical point of view, of the Bornean group, I may mention that I hope to be able to obtain a small collection from the mountains of Palawan before long, and also one from Sibutu.

2. On the Mammals of Mount Kina Balu, North Borneo.

By Oldfield Thomas, Natural History Museum.

[Received April 2, 1889.]

(Plate XXIV.)

The Mammals described in the present paper formed part of the large zoological collections made during 1887 and 1888 on the great mountain Kina Balu in North Borneo by Mr. John Whitehead, a gentleman who, although primarily an ornithologist, yet wisely collected whatever Mammals he was able to obtain in that most interesting and as yet unknown part of the island.

The species of which specimens were obtained number 21. Of these 6 were new to science, and 5 more were new to Borneo, thus increasing the known Mammal fauna of the island by no less than 11. The large number of new species is a most remarkable fact, and one that shows how far we still are from anything like a complete knowledge of the smaller Mammalia and their distribution; and this is especially the case with the Rodents, to which, as usual in such cases, the majority of the new forms belong.

Until more is known of the mammals inhabiting the other mountains of Borneo, it is not possible to draw any general geographical deductions from the present collection; but it may be noted that, of the additions to the Bornean fauna, one species was previously only known from the Himalayan region, where also is found the nearest ally of one of the new species, two are Sumatran, one is Javan, and one occurs in Celebes.

1. Semnopithecus hosei, Thos. P. Z. S. 1889, p. 159, pl. xvi.

a. Skull, 4000 feet.

The only other locality known for this species is Baram, on the coast at the junction of Brunei and Sarawak, where the type specimen was obtained by Mr. Charles Hose. The present skull is that mentioned in the original description (*supra*, p. 159).

2. CYNOPTERUS ECAUDATUS, Temm.

a. 3000 feet. 29/3/88.

Previously only known from Sumatra. This species may be readily distinguished from the somewhat similar *C. lucasi*, Dobs.[1], by its rather smaller size, by not possessing any trace of a tail, and by the attachment of its wing-membrane to the distal third of the first phalanx of the hallux instead of to its base.

3. TUPAIA FERRUGINEA, Raffl.

a–b. 3000 feet. 3/87.
c. 8000 feet. 5/2/88.

4. HYLOMYS SUILLUS DORSALIS, Thos. Ann. Mag. N. H. (6) ii. p. 407 (1888).

a. ♂. 8000 feet. 2/88. *Type* of var.
b. ♂. 8000 feet. 9/2/88.
c. 3000 feet. 21/3/88.

Essential characters as in the typical variety, but with a more or less distinct black line running from between the eyes down the neck to the middle of the back.

Dimensions:—Head and body (c.) 116 millim.; tail 16; hind foot 25.

Since all the five or six specimens of *Hylomys* obtained on Kina Balu show a black dorsal line, sometimes, it is true, faint and indistinct, but always present, I believe this to be a valid geographical race, characteristic at least of Mount Kina Balu, if not of the whole of Borneo, whence, up to the present, no other specimens have been obtained. It should be stated, however, that Dr. F. A. Jentink, of the Leyden Museum, where the type of *H. suillus* is preserved, believes it to be not worthy of separation from that animal; but as he is inclined to give, in certain other allied groups, rather less importance to the presence or absence of a dorsal streak than appears to me correct, I do not as yet feel disposed definitely to withdraw the merely varietal name already given to the Kina Balu *Hylomys*.

The true *Hylomys suillus* has been recorded from Burma, the Malay Peninsula, Sumatra, and Java.

5. CHIMARROGALE HIMALAYICA, Gray.

a. Ad. sk.

The occurrence of this fine Water-Shrew on Mount Kina Balu is a most interesting fact, and affords a remarkable instance of the relation that the fauna of the mountainous regions of the Malay islands bears to that of the Himalayas. The species has previously only been recorded from Sikhim, Assam, and the Katchin Hills in the North of Burma. The Bornean specimen is rather smaller than the type, its hind foot measuring only 20 millim. in length as against 22·5, but is otherwise identical; this difference in size is very probably only sexual.

[1] Ann. Mag. N. H. (5) vi. p. 163 (1880).

6. Crocidura (Crocidura), sp. inc.

a–c. 1000 feet. 1887 and 1888.

In the present state of our knowledge I am unable to name these Shrews with certainty. They are allied to, but markedly larger than, *C. fuliginosa*, Blyth.

7. Pteromys nitidus, Desm.

a. Very young. 3000 feet. 4/88.

8. Sciurus bicolor ephippium, Temm.

a. ♀. 3000 feet. 14/3/88.

9. Sciurus prevostii, Desm.

a, *b*. 1000 feet. March, 1887.

c, *d*. 1000 feet. 1888.

a, *b*, and *c* are of the grey-backed form of this species, and *d* of the black form, "*S. pluto*, Gray."

10. Sciurus jentinki, Thos. Ann. Mag. N. H. (5) xx. p. 129 (1887).

a. ♀. 3000 feet. 14/2/87. *Type*.

b. 3000 feet. 14/2/87.

Native name "Tigae."

Size about equal to that of *S. tenuis*, Horsf. General colour of upper surface yellowish grey, strongly suffused with orange on the head and along the centre of the back. Hairs dark slaty grey for four fifths of their length, their tips yellow or orange. Face grey, but with a white rim round each eye. Ears extremely short, rounded, their edges white or pale yellow, and standing out in marked contrast against a patch of wholly black hairs situated just behind them on the sides of the neck. Hairs of chin, chest, and belly slaty grey basally, dull yellowish white distally; line of demarcation on sides quite gradual. Limbs coloured as in *S. tenuis*; hind soles hairy for their proximal 8 millim. Tail slender, the hairs being comparatively short, only about 10 or 12 millim. in length; these hairs are broadly ringed with orange basally, and have a black subterminal and a white terminal band.

Incisors dark yellow above and below; premolars $\frac{2}{1}$; molars rather smaller and lighter than those of *S. tenuis*.

Dimensions of specimen *a*, a female, preserved in skin:—

Head and body 140 millim.; tail, without hairs 103, with hairs 136; hind foot 32·5; ear, above crown 4·0.

Skull: tip of nasals to bregma 25; greatest breadth 20; length of nasals 9·5; interorbital breadth 11·8; palate, length 16·6; length of upper tooth series 6·4.

This species is most nearly allied to *S. tenuis*, Horsf., which ranges from the Malay Peninsula to Borneo, and of which there are a large number of examples in the Natural History Museum. It differs, however, in its much paler orange-washed back, shorter and more

prominently white-rimmed ears, the dark patches behind the latter, and in its less bushy tail. It is also worthy of note that although *S. tenuis*, throughout its range, is singularly uniform in coloration, yet, if anything, the Bornean specimens of it are darker in colour, and are therefore still less like *S. jentinki* than are those from the Malay Peninsula, a fact which shows that the two species have no tendency to grade into one another.

I have named this species in honour of my friend Dr. F. A. Jentink, Director of the Leyden Museum, to whose labours we are indebted for much of our knowledge of the mammals inhabiting the East-Indian Archipelago.

Mr. Whitehead informs me that *S. jentinki* ranges on Mount Kina Balu from about 3000 to 8000 feet altitude.

11. Sciurus notatus, Bodd. Elench. Anim. p. 119 (1785).

S. badjing, Kerr, Linn. An. K. p. 262 (1792).
S. plantani, Ljung. K. Vet.-Ak. Handl. xxii. p. 99 (1801).

a, *b*. ad. ♀ and imm. 3000 feet. 28/3/88.

This common species, the Plantain Squirrel of Pennant, is represented by two specimens of the blue-bellied type, without any trace of red or yellow on their undersides.

At the cost of another change of name, I am glad to be able now to supersede the barbarous term "*S. badjing*," which I was guilty of resuscitating on account of its priority over the commonly used "*S. plantani*." An examination of Boddaert's rare work proves, however, that the Plantain Squirrel had already received a Latin name there, and one also that is fortunately both classical and appropriate.

12. Sciurus whiteheadi, Thos. Ann. Mag. N. H. (5) xx. p. 127 (1887). (Plate XXIV.)

a. 3000 feet. 24/2/87. *Type*.
b. 3000 feet. 28/2/87.
c. ♂, in spirit.

Native name "Mantok."

Size very small, only slightly larger than that of *S. exilis*, Müll. Ears narrow, pointed, their tips provided with beautiful black and white pencils of hair, so long as to reach, when laid backwards, almost to the withers; the ears themselves edged with black, and with a marked white spot on the head behind them. Colour otherwise uniformly finely grizzled olive-grey all over, exactly as in *S. exilis* and *S. concinnus*. Claws both before and behind long, very sharp and much curved, so as to enable the animal to hang on to almost, or quite, vertical surfaces. Palms with five large pads. Soles with four subequal digital pads, and a small circular posterior pad; back of sole hairy for about 9 or 10 millim.

Skull very peculiarly shaped, with a short and broad cranial, and a disproportionally long and powerful facial portion, the distance from the tip of the nasals to a point between the anterior edges of the orbits 12·8 millim., as compared to 11·3 in *S. exilis*, and 11

millim. in *S. melanotis*, the latter an animal with the cranial part of the skull as large as, if not larger than, that of *S. whiteheadi*.

Teeth :—incisors narrow, strongly convex in front, orange above, nearly white below; premolars $\frac{2}{1}$, the anterior upper minute, circular in section.

Dimensions of specimen *c*, an adult male in spirit :—Head and body 84 millim.; tail, without hairs 67, with hairs 98; hind foot 25·7; ear, without hairs 10·0, with hairs 26; head 29·3; tip of muzzle to eye 18, to ear 24; forearm and hand 36·5; heel to front of last foot-pad 12·3; hairy part of sole in centre line 9·4.

This very beautiful little Squirrel is perhaps the most attractive of all the new Kina Balu mammals. It belongs to a group of pigmy squirrels, consisting of *S. exilis*, *S. melanotis*, and a species only recently described by myself, namely *S. concinnus*; the latter species comes from the Philippines, but the other two, like *S. whiteheadi*, both occur in Borneo, which possesses therefore three of the four members of the group. Of these species, *S. whiteheadi* is evidently most nearly allied to *S. exilis*, but it is readily distinguishable from that, as from all the others, by its beautiful elongated ear-tufts, which, in proportion to its size, are probably longer than those of any other known Squirrel, not even excepting *Rheithrosciurus macrotis*.

Mr. Whitehead informs me that this little Squirrel may often be seen on the upper slopes of Kina Balu running up and down the trunks of the trees, and apparently gnawing at their bark. The position in the figure (Plate XXIV.) is copied from a sketch made by Mr. Whitehead from the living animal.

13. Mus infraluteus, Thos. Ann. Mag. N. H. (6) ii. p. 4[illegible] (1888).

a. 3000 feet. 22/3/88. *Type*.

Size large. Fur coarse and harsh, but not spinous. General colour dark greyish brown, the tips of the shorter hairs with a silvery lustre. The longer straighter hairs numerous, not markedly lengthened on the rump, uniformly black. Under surface a dirty yellow-brown, the tips of the straighter hairs dull orange, their base and whole of the under-fur slaty grey. Ears small and rounded, naked. Hands and feet brown; last hind foot-pad elongate. Tail rather shorter than the head and body, thinly haired, dark brown above and below; rings of scales averaging about 8 or 9 to the centimetre. Skull stout and heavily built. Supraorbital edges strongly ridged. Anterior edge of outer wall of infraorbital foramen evenly convex forwards. Palatine foramen about equal in length to the two anterior molars together, not reaching backwards to the front of m^1.

Teeth powerful; incisors broad, dark yellow in front above and below.

Dimensions :—Head and body (*c*.) 285 millim.; tail (extremity wanting) 235; hind foot 51; heel to front of last foot-pad 26; length of the same pad 9·3.

Skull: tip of nasals to lambda 51; nasals, length 21·8, breadth 6·5; interorbital breadth 8·8; infraorbital foramen, length of outer wall 7; palate, length 32; diastema 16·7; anterior palatine foramen 8·4; combined breadth of upper incisors 4·6; length of upper molar series 10·7.

This fine Rat has a certain similarity to the Indian Bandicoot Rats (*Nesokia*), resembling them both in general external appearance and in the stout and heavy build of the skull and teeth. No species hitherto described can be mistaken for it, as all the Oriental Rats which have external or cranial proportions at all similar are distinguished either by having elongated rump-bristles or parti-coloured white-tipped tails.

The single specimen obtained was found lying dead in the forest.

14. Mus rattus, L.

a, *b*. 8000 feet. 4 and 5/2/88.
c, *d*. 3000 feet. 1/4/88.

The two specimens from an altitude of 8000 feet have their fur long and soft, while in those from 3000 it is short and harsh, so that it seems difficult to believe that both the forms can be referable to the same species.

15. Mus sabanus[1], Thos. Ann. Mag. N. H. (5) xx. p. 269 (1887).

a. 1000 feet. 3/87. *Type*.
b. (?) juv. 3000 feet. 21/3/88.

Fur short and fine, mixed with slender spines along the centre of the back. General colour rufous, mixed with brown along the top of the head and back, brighter and clearer on the cheeks and sides, the general tone very similar to that of *M. jerdoni*. Whole of underside pure creamy white, sharply defined from the rufous of the sides. Outsides of limbs like sides, but rather greyer, inner sides white; lower leg and ankles greyish brown all round. Hands and feet brown along the middle of their upper surfaces, their edges white, the contrast especially strongly marked on the feet, where a broad band of deep blackish brown passes along the centre, edged on each side with pure white. Sole-pads large, smooth, and prominent, the last one about three times as long as broad. Fifth hind toe, without claw, reaching to the end of the first phalanx of the fourth. Ears rounded, rather short, laid forward they barely reach to the posterior canthus of the eyes. Tail enormously long, evenly finely haired, the scales, which are large, averaging from seven to nine to the centimetre, uniformly dark brown above and below throughout, but the hairs black for the proximal two thirds above only, elsewhere pure white. Mammæ 2–2=8.

Dimensions of the type, an adult male, preserved as a skin:—

Head and body 280 millim.; tail 340; hind foot 43·5; ear, above

[1] From Saba, the district of North Borneo in which Mount Kina Balu is situated.

head 18, breadth 18; heel to front of last foot-pad 23; length of last foot-pad 7·0.

Skull: tip of nasals to centre of fronto-parietal suture ("bregma") 36 millim.; nasals, length 21, greatest breadth 6·0; interorbital breadth 7·7; outer wall of infraorbital foramen, length 4·7; palate, length 26·5; length of palatal foramen 7·9; diastema 13·6; length of upper molar series 9·4.

Dimensions of a fine female in spirit, preserved in the Museo Civico, Genoa:—Head and body 230; tail 393; hind foot 49; ear 20; heel to front of last foot-pad 25; length of last foot-pad 8·8.

This spirit-specimen was obtained by Signor Beccari at Sungei Bulu, W. Sumatra, thus affording another instance of the relationship between the mountain-faunas of Sumatra and Borneo. Its examination, which I owe to the kindness of my friend the Marquis of Doria, has enabled me to add certain particulars, only observable in spirit-specimens, to the original description of this species.

Mus sabanus belongs to a well-marked group of Rats which contains *Mus jerdoni*, Bly., *M. niveiventer*, Hodgs., *M. coxingi*, Swinh., *M. edwardsi*, Thos., *M. helfwaldi*, Jent., *M. alticola*, Thos., and others. These species are, however, all very much smaller than it is, with one exception, *M. edwardsi*, which is as much larger, and not one of them has a tail of anything like the extraordinary length of that of *Mus sabanus*.

One species, indeed, also a native of Borneo, has a certain superficial resemblance to the present one, although belonging to quite a different group of Rats. This is *M. muelleri*, Jent., of about the same size, and with a nearly equally long tail; but it may be readily distinguished by its coarse *Mus decumanus*-like fur, yellowish instead of rufous coloration, the less sharply defined white underside, and by the quite uniformly brown-haired feet and tail.

16. Mus lepturus, Jent.

a. Ad.

b. Imm. 3000 feet. 24/3/88.

Described by Dr. Jentink from Javan examples now in the Leyden Museum.

17. Mus alticola, Thos. Ann. Mag. N. H. (6) ii. p. 4[illegible] (1888).

a, *b*. ♂ ♀. 8600 feet. 24/2/88. ♀. *Type*.

Fur mixed with flexible spines both above and below. General colour above a peculiar bluish grey, not speckled or grizzled, darker along the median line. Dorsal hairs and spines creamy white basally, gradually darkening to grey terminally. Underside pale yellowish white, the hairs and spines uniformly of this colour to their bases; the line of demarcation on the sides not very sharply defined. Hands and feet white, the hairs short and fine, fifth hind toe (without claw) reaching nearly to the end of the first phalanx of the fourth. Tail finely ringed, the rings averaging about 10 [illegible]

11 to the centimetre ; short-haired, sharply bicolor from base to tip, brown above, yellowish white below.

Dimensions, ♀ :—Head and body (probably stretched), 177 m ilm. tail 162 ; hind foot 32 ; heel to front of last foot-pad 16.

Skull : tip of nasals to lambda (junction of sagittal and lambdoid sutures) 34 ; nasals, length 15 : interorbital breadth 7·4 ; palate, length 19 ; length of anterior palatine foramina 6 ; upper molar series 5·8.

This species is most nearly allied to the Nepalese *M. niveiventer*, Hodgs., but may be distinguished by its unspeckled back, by the more gradual passage of the upper into the lower colour, and by its larger size.

So far as its collector has observed, *Mus alticola* is confined to the higher parts of Mount Kina Balu.

18. Mus musschenbroecki, Jent.

a, *b*. 1000 feet. 3/87.

c, *d*. ♂ ♀. 3000 feet. 18 and 20/3/88.

It is of considerable interest to find this species, previously only known from Celebes, in Borneo, on a different side of the line separating the Oriental from the Australian regions. Its occurrence here suggests that other members of the Oriental element in the peculiar Celebean fauna may also prove to have survived on the tops of the Bornean mountains.

19. Mus ephippium, Jent.

a, *b*. ad. and juv. 1000 feet. 3/87.

It appears rather doubtful whether this species is really distinct from *Mus concolor*, Bly., found in Burma and the Malay Peninsula; but for the present I do not feel justified in definitely uniting the two forms, and the Kina Balu individual clearly belongs rather to the Sumatran '*ephippium*' than to its northern ally.

20. Chiropodomys gliroides, Bly.

a. 1000 feet. 1/88.

This specimen is immature, but would not apparently have ever reached the dimensions of the two individuals obtained by Mr. Wallace at Sadong, and now in the British Museum. However, it exactly matches some of those collected by Signor L. Fea in Burma and Tenasserim, and is evidently specifically identical with them. In the general account now in course of publication of the collection made by that gentleman [1] some further details as to the character and synonymy of this beautiful little species will be found.

21. Trichys guentheri, nom. nov.

Trichys lipura, Günth. P. Z. S. 1876, p. 739.

a. juv. 3000 feet. 3/4/88.

This specimen is the fourth example of the interesting genus

[1] Ann. Mus. Genov. (2) v. 1889.

Trichys that has come to England, although there have been examples of it for many years in the Leyden Museum. The first one, a tailless individual, was described by Dr. Günther as "*Trichys lipura*," under the circumstances detailed in his paper of the present year (*suprà*, p. 75). Since, however, I differ from him as to the admissibility of the name '*lipura*' for a species which normally has a long tail, I propose now to rename the species accordingly.

No better name can be found for it than of its original describer, whose judgment in forming a new genus for it is fully confirmed by an independent examination of its cranial characters, even after the downfall of the peculiarity supposed, and not unnaturally, to belong to it of not possessing any trace of a tail.

As to the alleged applicability of Shaw's name "*Hystrix fasciculata*" to this Porcupine, I can only express my entire agreement with Dr. Günther's opinion (*l. c.*) that that name should stand as a synonym of *Atherura macrura*, L.

The Kina Balu specimen, although only half-grown, shows all the characteristics of the genus, and is distinguishable at the first glance from *Atherura* by its short spines and narrow parallel-sided caudal bristles.

3. Second Account of the Fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat, East Coast of Arabia [1]. By G. A. Boulenger.

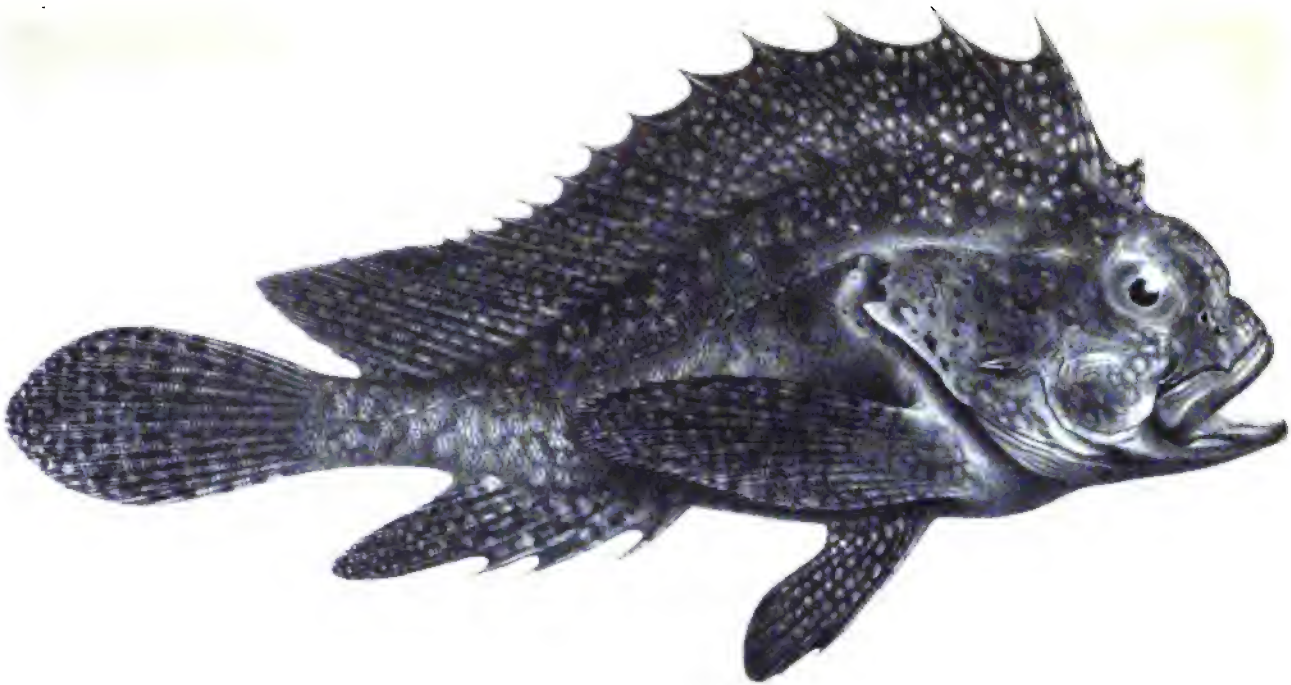
[Received April 11, 1889.]

(Plates XXV.–XXVIII.)

At the close of last year the Natural History Museum received a second collection of Fishes from its generous correspondent at Muscat, Surgeon-Major A. S. G. Jayakar; this was shortly followed by a third, received a few days ago. Other examples of a number of the rare or new species enumerated in my preceding list having been sent again, I have, in some cases, been able to supplement my former descriptions; but all the species enumerated hereafter, and to which numbers are attached, are new to the fauna of Muscat. Eight of the known species are altogether new to the Indian Ocean, viz.:—*Erythrichthys schlegeli*, *Pomatomus telescopium*, *Chætodon modestus*, *Echeneis clypeata*, *Trigla capensis*, *Chilomycterus echinatus*, *Echinorhinus spinosus*, and *Rhinobatus schlegeli*. Five species are considered to be new. The Sharks and Rays, which were hardly represented at all in the first collection, have now reached us in numbers, and, from the size and beauty of most of the skins, will, to say nothing of the great zoo-geographical interest that attaches to many of them, form a welcome addition to the Fish-Gallery of the Museum, where Mr. Jayakar's previous donations of large Sea-Perches, Scombroids, Sphyrænas, and Sword-fishes already have a conspicuous

[1] *Cf.* P. Z. S. 1887, pp. 653–667.

P. Z. S. 1869. Pl. XXV.



Peter Smit del et lith.

TETRAROGE GUENTHERI.

Mintern Bros. imp.

R. Minterri del. et lith.

CARANX JAYAKARI

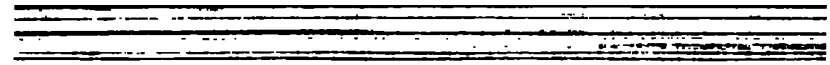
Minterri Bros. imp.

1. TRIGLA ARABICA 2. TRIGLA POLYSTICTA

Peter Smit del et lith

MONACANTHUS MELANOPROCTES

Mintern Bros. imp.



place. Thanks to the exertions of Mr. Jayakar, the number of species of Fishes recorded from Muscat now known amounts to 256.

ACANTHOPTERYGII.

Percidæ.

1. Serranus latifasciatus, Schleg.

2. Serranus diacanthus, C. & V.

3. Serranus salmonoides, Lacép.

4. Serranus coromandelicus, Day.

D. $\frac{11}{16}$. A. $\frac{3}{8}$. P. 17. L. lat. 145–150. L. tr. $\frac{18-19}{55-58}$.

Canines moderate; two rows of teeth on the sides of the lower jaw, those of the inner row largest. Length of the head thrice and three fifths or thrice and two thirds in the total; forehead very convex, with a depression between the nostrils; diameter of the eye six or six and a half times in the length of the head; maxillary reaching posteriorly to the vertical of the posterior third of the eye; præoperculum finely serrated posteriorly, the denticulations stronger at the angle, which is rounded and not produced; upper border of opercle slightly sinuous; median opercular spine nearer the lower than the upper, lower much further back than the latter. Depth of the body about four times and a half in the total length. Third and fourth dorsal spines longest, a little longer than the longest branched rays, which are about once and a half as long as the posterior spines. Pectorals reaching to below the sixth or seventh dorsal spine. Caudalis truncate, when spread out with perfectly straight posterior border. Dark purplish brown on the upper surfaces and fins, paler brown inferiorly; body and dorsal fin with scattered subcircular whitish spots of various sizes.

A single dry specimen, 21 inches long, is in Mr. Jayakar's collection; another, 26 inches long, stuffed, likewise from Muscat, formed part of the collection of the late East-India Museum transferred to the British Museum in 1880. Except in the rather smaller scales, these specimens agree well with one of the types, a half skin from Madras, presented by Mr. Francis Day.

5. Serranus jayakari, sp. n.

D. $\frac{11}{16-17}$. A. $\frac{3}{8}$. P. 17. L. lat. 140-150. L. tr. $\frac{18-20}{40-45}$.

Canine teeth small; teeth on the sides of the lower jaw mostly in four rows. Length of head thrice and one fourth to thrice and one third in the total; forehead convex; diameter of the eye six and a half or seven times in the length of the head; maxillary reaching to below the centre of the posterior border of the eye; præoperculum finely serrated posteriorly, the denticulations slightly stronger at the angle, which is obtuse and not produced; upper border of opercle slightly sinuous; median opercular spine nearer the lower

than the upper, lower much further back than the latter, extremely indistinct. Depth of the body about four time total length. Third and fourth dorsal spines longest, nearly as the longest branched rays, which are about twice as lon posterior spines. Pectorals reaching to below the seventh o dorsal spine. Caudalis slightly emarginate. Uniform lighter inferiorly.

Three skins, 28 to 29 inches long.

6. Serranus rogaa, Forsk.

7. Serranus sonnerati, C. & V.

8. Anthias formosus, sp. n.

D. $\frac{10}{14}$. A. $\frac{3}{7}$. L. lat. 31. L. r. 45. L. tr.[1] $\frac{2}{17-19}$.

Length of the head twice and two thirds in the total caudal); snout shorter than the diameter of the eye, whic fourth the length of the head; maxillary extending to b centre of the eye; præoperculum with finely denticulated border and two or three spines at the angle; two opercula lower longest; a small suprascapular spine. The depth of t equals the length of the head. Third dorsal spine, third, fou fifth branched dorsal rays, and second branched anal ray into filaments, that of the third dorsal ray being the longest measuring half the length of head and body (without third anal spine longest. Ventrals extending to the anal. deeply forked. Bronzy olive, here and there with blotche genta-red: fins, and three wavy longitudinal bands on each s rosy; ventrals, in one specimen, tipped with blackish; base bronzy-olive, like the back.

Total length 7½ inches.

Two specimens.

Nearest ally: the Japanese *A. margaritaceus*, Hilg.

9. Apogon tæniatus, C. & V.

10. Pomatomus telescopium, Risso.

The occurrence of this Mediterranean and Atlantic deep at Muscat is of great interest.

11. Synagris isacanthus, Blkr.

12. Erythrichthys schlegeli, Gthr.

D. 8–9 | 1 | $\frac{1}{11}$. A. $\frac{3}{10}$. L. l. 65. L. tr. $\frac{6}{18}$.

A series of minute teeth in each jaw. Length of head th one third or thrice and a half in the total; the diameter of equals the length of the snout, and one fourth the length of t the maxillary extends to below the anterior third of the eye greatest width equals three fourths or four fifths the dia latter; borders of the præoperculum forming a right angle.

[1] Counted below the sixth dorsal spine.

This species does not appear to have been recorded since its description, by Schlegel, in the 'Fauna Japonica.' Two skins, 21 inches long, were obtained by Mr. Jayakar.

Squamipinnes.

13. Chætodon modestus, Schleg.

Another Japanese species, new to the Indian Ocean.

Mullidæ.

14. Upeneus pleurotænia, Playf.

Cirrhitidæ.

15. Cirrhitichthys maculatus, Lacép.

Scorpænidæ.

16. Tetraroge guentheri, sp. n. (Plate XXV.)

D. $\frac{13}{10}$. A. $\frac{3}{6}$.

Vomer and palatines toothed. Length of the head two fifths of the total (without caudal); diameter of the eye nearly one fourth the length of the head. No barbels; maxillary extending to below the anterior third of the eye, and slightly beyond the posterior præorbital spine, which is not quite so strong as the præopercular; two strong wavy frontal ridges; interorbital space narrower than the orbit. Scales minute. Dorsal commencing above the centre of the eye, without notch; first spine shortest, measuring half the diameter of the eye, second and third longest, half the length of the head; the longest branched dorsal rays once and a half the length of the last dorsal spines; third anal spine longest, as long as the fifth dorsal. Pectorals nearly as long as the head, extending beyond the ventrals, which reach the anal. Caudal free from dorsal. Head and body reddish brown, fins blackish, everywhere with closely set round pale spots.

Total length $8\frac{1}{2}$ inches.

A single specimen.

17. Pterois antennata, Bl.

18. Chorismodactylus multibarbis, Rich.

Kurtidæ.

19. Pempheris molucca, C. & V.

Trichiuridæ.

20. Trichiurus haumela, Forsk.

Acronuridæ.

21. Naseus brevirostris, C. & V.

CARANGIDÆ.

22. CARANX TRACHURUS, Lacép.

23. CARANX AFFINIS, Rüpp.

24. CARANX MALABARICUS, Bl. Schn.

25. CARANX LEPTOLEPIS, C. & V.

26. CARANX CILIARIS, Bl.

27. SERIOLA DUMERILII, Risso.

28. NAUCRATES DUCTOR, L.

SCOMBRIDÆ.

29. PELAMYS ORIENTALIS, Schleg.

30. CYBIUM LINEOLATUM, C. & V.

31. ECHENEIS CLYPEATA, Gthr.

This species was known from the Cape of Good Hope. *E. lop[illegible]ides*, Guich., which is perhaps identical, is from Bourbon.

32. ECHENEIS NAUCRATES, L.

Suctorial disk with 24 laminæ.

COTTIDÆ.

33. TRIGLA CAPENSIS, C. & V.

34. DACTYLOPTERUS ORIENTALIS, C. & V.

BLENNIIDÆ.

35. SALARIAS UNICOLOR, Rüpp.

36. SALARIAS LINEATUS, C. & V.

SPHYRÆNIDÆ.

37. SPHYRÆNA AGAM, Rüpp.

38. SPHYRÆNA ACUTIPINNIS, Day.

LABRIDÆ.

39. STETHOJULIS INTERRUPTA, Blkr.

40. PLATYGLOSSUS MARGINATUS, Rüpp.

41. JULIS LUNARIS, L.

42. PSEUDOSCARUS GHOBBAN, Forsk.

43. PSEUDOSCARUS TROSCHELII, Blkr.

44. PSEUDOSCARUS CYANOGNATHUS, Blkr.

ANACANTHINI.

Ophidiidæ.

45. Brotula multibarbata, Schleg.

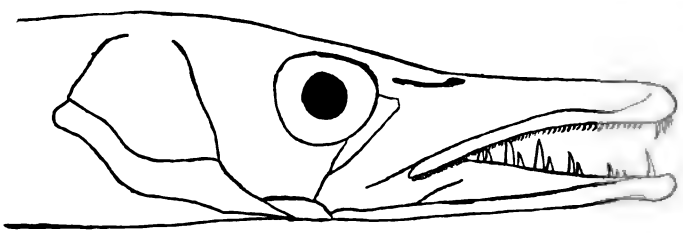
B. ensiformis, Gthr., and *B. maculata*, Day, do not seem to me to differ specifically from *B. multibarbata*.

PHYSOSTOMI.

Scopelidæ.

46. Sudis jayakari, sp. n.

A single specimen, 6 inches long, of the deep-sea genus *Sudis* forms part of Mr. Jayakar's third collection. Although in too poor a condition to allow of a detailed description, especially with regard to the fin-rays, it is yet sufficiently distinct from the previously described species, *S. hyalina*, Bp., from the Mediterranean, and *S. ringens*, Jord. & Gilb., from the coast of California, to justify the establishment of a new name.



Head of *Sudis jayakari*, enlarged.

The mouth does not extend to below the eye, and its length is twice and one third in that of the head. About 70 minute teeth in each maxillary; four, posterior largest, in each præmaxillary. Mandible with 12 teeth on each side, two of which are minute: the anteriormost and the three posterior of the inner row very large and fang-like. Six large, fang-like, palatine teeth on each side. Dorsal halfway between the head and the caudal, a short distance behind the ventrals, which are halfway between the mouth and the caudal fin.

D.? A. 30. L.l. 63.

Total length (without caudal) 150 millim.; length of head 37; depth of body 10; diameter of the eye 7; præorbital length of the head 17; postorbital length of the head 13.

Scombresocidæ.

47. Belone melanostigma, C. & V.

48. Belone appendiculata, Klunz.

MURÆNIDÆ.

49. MURÆNESOX CINEREUS, Forsk.

50. OPHICHTHYS CIRRHOCHILUS, Blkr.

51. OPHICHTHYS CANCRIVORUS, Rich.

52. MURÆNA TESSELLATA, Rich.

PLECTOGNATHI.

SCLERODERMI.

53. BALISTES ERYTHRODON, Gthr.

54. MONACANTHUS MONOCEROS, L.

55. MONACANTHUS MELANOPROCTES, sp. n. (Plate XXVI[illegible]III.

D. 32–34. A. 32–34.

Skin rough, villose; no caudal spines. Depth of body twice [illegible] and a half to twice and three fourths in the total length. Snout l[illegible]ong, with straight or slightly concave upper profile. Pectoral fin b[illegible]elow the posterior border of the eye. Dorsal spines above the cent[illegible]e of the eye, strong, as long as the distance between the nostril and[illegible] the mouth; armed behind with a double series of small barbs, poi[illegible]nting outwards and downwards, and in front with a double series of s[illegible]mall tubercles. Soft dorsal and anal fins low. Caudal rounded. [illegible]Ventral spine small, armed with spikes. Pale reddish brown; ch[illegible]eeks and sides of body lineolated with blackish, the lines oblique on t[illegible]he cheeks, and straight from the gill-opening to the caudal; a b[illegible]road blackish band from the dorsal spine to below the anterior thi[illegible]rd of the soft dorsal fin, and two others on each side of the back, br[illegible]oader than the interspace between them; dorsal and anal fin uniform p[illegible]ale reddish; vent in a blackish spot.

Total length 8 inches.

Several specimens.

GYMNODONTES.

56. TETRODON MARGARITATUS, Rüpp.

57. TETRODON VALENTINI, Blkr.

58. DIODON HYSTRIX, L.

59. CHILOMYCTERUS ORBICULARIS, Bl.

60. CHILOMYCTERUS ECHINATUS, Gron.

CHONDROPTERYGII.

CARCHARIIDÆ.

61. CARCHARIAS ACUTIDENS, Rüpp.

A male, measuring 8 feet 5 inches.

62. Carcharias brevipinna, M. & H.

63. Carcharias hemiodon, M. & H.

An adult female measures 8 feet 4 inches.

64. Carcharias gangeticus, M. & H.

An adult female measures 9 feet.

65. Carcharias melanopterus, Q. & G.

66. Carcharias menisorrah, M. & H.

67. Carcharias murrayi, Gthr.

$\frac{29}{29}$ teeth in the outer row.

68. Galeocerdo tigrinus, M. & H.

69. Zygæna malleus, Risso.

70. Mustelus manazo, Blkr.

Lamnidæ.

71. Lamna spallanzanii, Bp.

Adult female, 10 feet long.

72. Lamna glauca, M. & H.

73. Odontaspis americanus, Mitch.

74. Alopecias vulpes, Gm.

Scylliidæ.

75. Stegostoma tigrinum, Gm.

Spinacidæ.

76. Echinorhinus spinosus, Gm.

Pristidæ.

77. Pristis pectinatus, Lath.

A specimen 16 feet long, with 34 pairs of rostral teeth.

Rhinobatidæ.

78. Rhynchobatus djeddensis, Forsk.

79. Rhinobatus halavi, Forsk.

80. Rhinobatus schlegeli, M. & H.

Torpedinidæ.

81. Torpedo marmorata, Risso.

Trygonidæ.

82. Urogymnus asperrimus, Bl. Schn.

MYLIOBATIDÆ.

83. AËTOBATIS NARINARI, Euphr.

84. DICEROBATIS EREGOODOO, Cant.

9 feet in diameter.

Notes are here appended on some of the fishes described by me as new in my first account, which have been regarded by Mr. Day[1] as synonyms of previously known species.

SERRANUS PRÆOPERCULARIS.

Six more specimens, adult (up to 28 inches long) and half-grown skins, and half-grown in spirit, having been sent by Mr. Jayakar, I have carefully compared them with the types and with *S. morrhua*, of which we have now in the Museum five dry specimens, presented by Mr. Jayakar, and two in spirit, from the Red Sea, presented by Dr. Klunzinger. Although very closely allied to *S. morrhua*, *S. præopercularis* is a perfectly valid species, constant in its coloration. The third dorsal spine at least equals the distance between the upper extremity of the border of the præoperculum and the extremity of the median opercular spine in *S. morrhua*; it is considerably shorter in *S. præopercularis*, which, in this respect, agrees with *S. latifasciatus*. The latter species differs from both in the lower opercular spine being placed much further back than the upper, and in having only 12 to 14 branched dorsal rays[2]. Excellent figures of half-grown *S. morrhua* have been given by Steindachner[3] under the name of *S. brunneus*; but I cannot admit this fish to be the *Epinephelus brunneus* of Bloch.

SERRANUS GIBBOSUS.

A second specimen, in spirit, has been received. It agrees in every respect with the type. Apart from the coloration, the shorter body distinguishes *S. gibbosus* from *S. striolatus*. I cannot understand how its specific distinction from *S. altivelis* can be questioned, even for a moment.

APOGON MAXIMUS.

Three more specimens having been sent, I have reinvestigated the character of this beautiful species, which is perfectly distinct from *A. bifasciatus*. There are constantly 9 branched rays in the anal, instead of 8 as in *A. bifasciatus*; the second dorsal spine is more than half the length of the third, instead of less than half; the posterior upper border of the maxillary is not overlapped by the suborbital, which tapers below the centre of the eye, whilst in *A. bifasciatus* the suborbital is wider and overlaps the maxillary throughout. The coloration is very different; and the large size (10 inches) also serves to distinguish *A. maximus* from *A. bifasciatus*, which does not exceed a length of 4½ inches.

[1] P. Z. S. 1888, p. 258, and Append. Fish. Ind. (1888).

[2] The type specimen of *S. morrhua*, which I have examined in the Paris Museum, has 14 soft rays. Another specimen, likewise from Mauritius, has 15 rays.

[3] Steindachner u. Döderlein, "Fische Japans," Denkschr. Ak. Wein, xlvii. p. 22, pl. v. figs. 1, 2 (1883).

IAGRAMMA JAYAKARI.

aving received a second specimen, a skin 22 inches long, from cat, agreeing in colour with the specimen so named by me, but D. $\frac{12}{21}$, I provisionally accept Mr. Day's opinion that *D. jaya-* is a colour-variety of *D. griseum*. According to Mr. Jayakar's the body, when fresh, is of a pale white colour, with yellow . Length of the longest spine "seven eighths" the depth of ody, in my diagnosis, is a lapsus for "two sevenths."

'HAREUS RUTILANS, C. & V.

y notes on this fish were, by an oversight, taken from a specimen *agellus affinis*, although the true *A. rutilans* was actually ded in Mr. Jayakar's first collection.

GRUS RUBER.

examination of a large series of specimens, I now consider this osed new species to be identical with *P. spinifer*, as suggested r. Day.

RANX JAYAKARI. (Plate XXVI.)

r. Day makes this a synonym of *C. nigrescens*. I have never an example of the latter, but if the figure in the 'Fishes of ' is to be relied upon, the two appear to be distinct. It is to marked that Mr. Day describes his *C. nigrescens* as having the nearly black, especially the dorsal," whilst the specimens of *yakari* before me, now three in number, have the fins devoid ack pigment. In *C. jayakari* the anterior rays of the anal are nearly three fourths the length of the base of the same fin. type specimen is figured on the Plate.

BRINA STRIATA.

comparison of the type with the figure of *U. sinuata*, Day, s founded upon quite young specimens, I find the following rences, which do not seem to be ascribable to age:—The origin e spinous dorsal falls in advance of the base of the pectoral in *nuata*, above the axil in *U. striata*; in the latter species there are ine sinuous dark bands on the body, while in *U. sinuata* there many as there are series of scales; besides the direction of these is not the same in the two fishes—since, for instance, the band nting above the base of the pectoral extends to the 8th and ays of the soft dorsal in *U. sinuata*, to the 16th and 17th in *riata*.

IGLA ARABICA. (Plate XXVII.)

is species has been considered identical with *T. polysticta* by Day, who states, I know not on what authority, that the "bony along the base of the dorsal fin" is wider in small than in examples. This view is clearly erroneous, from the fact that ermo-ossifications in question are *absolutely* more developed in *abica* than in the larger *T. polysticta*, as may be seen by the figure e XXVII.). The orbit of *T. arabica* is proportionally smaller than

that of the larger *T. polysticta*; and another conspicuous differe
to be found in the distance between the two dorsal fins, which i
fifths the length of the base of the spinous dorsal in *T. polysticta*
nearly one fourth in *T. arabica*. Three specimens of the latter sp
are now in the Museum. The type is figured on the Plate.

EXPLANATION OF THE PLATES.

PLATE XXV.

Tetraroge guentheri, p. 239. ⅔.

PLATE XXVI.

Caranx jayakari, p. 245. ½.

PLATE XXVII.

Fig. 1. *Trigla arabica*, p. 245. ⅔.
1 *a*. —— ——. Dorsal scutes.

Fig. 2. *Trigla polysticta*. D
scutes.

PLATE XXVIII.

Monacanthus melanoproctes, p. 242.

May 7, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair

The Secretary read the following report on the additions ma
the Menagerie during the month of April 1889:—

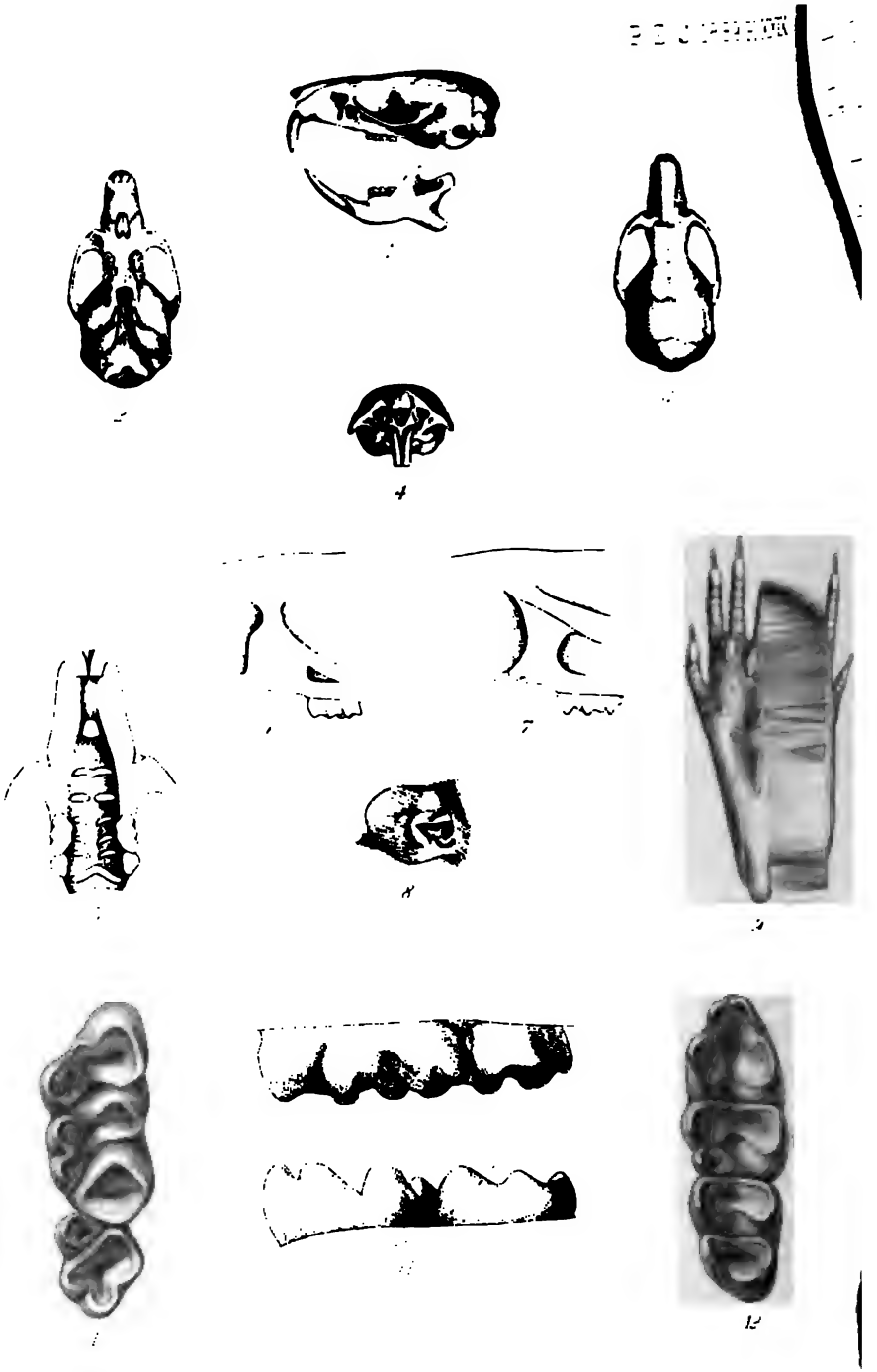
The registered additions to the Society's Menagerie during
month of April were 93 in number. Of these 40 were acquire
presentation, 27 by purchase, 10 on deposit, and 16 by birth.
total number of departures during the same period, by death
removals, was 88.

The most noticeable additions during the month were:—

1. A young male Sinaitic Ibex (*Capra sinaitica*) from Mount S
presented by Sir James Anderson, April 1st. This is the se
specimen of this fine Ibex as yet received by the Society.
former specimen, received December 30, 1884, is now quite a
It is unfortunate that the present specimen is also of the male s

2. A young male specimen of the Lesser Koodoo (*Strepsic
imberbis*) from East Africa, presented by George S. Mackenzie, E
April 18th. We have still living in the Gardens the adult ma
this beautiful species, received April 7, 1886. It is again unfortu
that the newly received animal is of the male sex; but as the sp
occurs in the territory of the new British East-African Company
may well expect to receive further specimens.

Mr. Sclater exhibited and made remarks on a living specime
an albino variety of the Cape Mole-rat (*Georychus capensis*), la
presented to the Menagerie by the Rev. George H. R. Fisk, C.M.
Mr. Fisk wrote that he had had the specimen in question in capti
two or three months, kept in a box half full of earth and fed pri
pally on potatoes. The ordinary colour of this animal was a unif
grey; the present specimen, however, was of a nearly pure white



Maud Horman Fisher del. et lith.

Imp. Cassell & Co.

XEROMYS MYOIDES

k eyes. Mr. Fisk said there are also three white specimens of animal in the Capetown Museum.

letter was read from Dr. E. C. Stirling, of Adelaide, containing py of his description of a new Australian Mammal (which had dy appeared in nearly the same form in 'Nature,' vol. xxxviii. 33), as read before the Royal Society of South Australia, Sept. 4th, 3, and published in that Society's 'Transactions.' Dr. Stirling now engaged in finishing a complete description of this very liar and interesting burrowing animal, which somewhat resembled pe Mole (*Chrysochloris*) in general external appearance, and cted to be able to communicate it to this Society when ready.

Ir. Seebohm exhibited the skin of a male example of *Phasianus somelas* which had been purchased in the flesh (along with a ale) in Leadenhall Market, where several others were also sold, was stated to have been sent over in a frozen state from the ns-Caspian provinces of Russia.

he following papers were read:—

Description of a new Genus of Muridæ allied to *Hydromys*. By Oldfield Thomas, Natural History Museum.

[Received March 26, 1889.]

(Plate XXIX.)

ne of the most singular and at the same time most isolated genera Iuridæ is *Hydromys*, of which the only species is the well-known tralian Water-rat. Alone of the family, and, with one exception[1], e of the Rodentia, this remarkable animal has only two molars ach side of each jaw, and the structure of these molars is at the e time quite different from that found in any other known Rat. ernally *Hydromys* has taken on characters suitable for a purely tic life, standing, so far as regards external specialization for mming, in an intermediate position between *Potamogale* and *Nec-ys*[2], less specialized than the former and more so than the latter. he skull of *Hydromys* differs from other Muridæ in many acters, and especially in the structure of the infraorbital foramen, ch is hardly murine in the ordinary sense at all, as it is of about same breadth above and below, and its external wall has not the riorly projecting plate found in the great majority of the Rats Mice (see Plate XXIX. fig. 7).

ltogether *Hydromys* has occupied a peculiarly isolated position he family, no other genus showing any approach towards it, and e is therefore a proportionate amount of interest in the discovery new form allied to it. The proof of alliance lies wholly in the

[1] *Heterocephalus phillipsi*, see P. Z. S. 1885, p. 847.

[2] Peters, Abh. Ak. Berl. 1860, p. 152. Regarded as a subgenus of *Holochilus*, nas, P. Z. S. 1882, p. 101.

dentition, as both the cranial and external characters of the new genus are those of ordinary Muridæ. The new form, by its structure, is obviously a land- and not a water-animal, and on this account, in contradistinction to its aquatic ally *Hydromys*, I propose to call it

XEROMYS[1], g. n.

External form murine. Tip of muzzle as in *Mus*, not as in *Hydromys*. Toes unwebbed. Tail scaly, very finely haired. Skull as in *Mus*, except that the supraorbital edges are rounded. Teeth both in number and structure as in *Hydromys*.

XEROMYS MYOIDES, sp. n.

External appearance exactly like that of an ordinary *Mus*. Size about twice that of *Mus musculus*. Ears short (as compared to most members of *Mus*), rounded, laid forward they only reach to within about 3 or 4 millim. of the posterior canthus of the eye; their anterior edge without the little supplementary flap found in *Hydromys*. Fur very short, uniform in length. Whiskers as in *Mus*, fewer and slenderer than in *Hydromys*. General colour above dark slaty grey, below white, the line of demarcation not sharply defined. Ears grey. Arms and legs like back; hands and feet very thinly haired, almost naked terminally, white. Palms and soles (Plate XXIX. fig. 9) naked, the former with five and the latter with six pads, the last hind pad elongate. Pollex with a short broad nail, all the other digits with claws; fifth digit on each foot, without claw, reaching just to the base of the fourth. Tail about the length of the body without the head, slender, scaly, the scales rather irregularly disposed, very small, averaging about 20 to 22 to the centimetre, the whole tail very thinly covered with fine white hairs; its substance pale flesh-colour above and below. Palate-ridges exactly as in *Hydromys*, *i. e.* three predental, the third notched in its centre, three interrupted interdental ridges, and one posterior uninterrupted (see Plate XXIX. fig. 5). Mammæ 0—2=4, as in *Hydromys*.

Skull (Plate XXIX. figs. 1–4), in its general form, not unlike that of a small Rat, say of the common N. Australian *Uromys cervinipes*, Gould. Nasals reaching much further forwards than in *Hydromys*, but not so far as in *Mus*, just falling short of the level of the front of the premaxillæ. Interorbital region smoothly convex, the supraorbital edges rounded, not ridged or beaded. Interparietal very broad transversely, and narrow antero-posteriorly. Infraorbital foramen typically murine in character, the outer wall broad and slightly projecting forwards (fig. 6). Anterior palatine foramina short, not equalling the combined length of the two upper molars. Bullæ small, inflated, transparent.

Teeth.—Upper incisors long, less curved than in *Mus*, and recalling in their general appearance those of the Voles. Their front surfaces smooth, ungrooved, orange in colour. Molars (Plate XXIX. fig. 10) as in *Hydromys chrysogaster*, except that the lateral ends of the lobes are shorter and rounder, and that the inner wall of the second

[1] ξηρὸς, dry; ἡ ξηρὰ, the dry land.

lobe of $m.^1$ is slightly folded inwards at its centre. Lower incisors very long, their front surface white. Lower molars (fig. 4) as in *Hydromys*, but the walls of the large anterior lobe of $m.^1$ are notched, so as to give a rather more cuspidate character to the tooth.

Dimensions of the type, an adult female in spirit:—

Head and body 111 millim.; tail 85; hind foot 23·2; ear 10×10·5; head 33; forearm and hand 29; heel to front of last foot-pad 19·8; length of last foot-pad 2·6.

Skull.—Basal length 26; greatest breadth 15; nasals, length 8·9, breadth 3·3; interorbital breadth 5·0; interparietal, length 3·1, breadth 9·2; infraorbital foramen, length of outer wall 2·8, distance from outer corner of one foramen to that of the other 7·6; palate, length 16, breadth outside $m.^1$ 5·5, inside $m.^1$ 2·1; diastema 9; length of palatine foramina 3·9; length of $m.^1$ 2·8, of $m.^2$ 1·5; of the two together *in situ* 4·1.

Hab. Port Mackay, Queensland (Godeffroy Museum).

The above given being the combination of characters presented by the new form, we may turn to the interesting questions as to the phylogeny of *Hydromys* naturally raised by its discovery. Had the origin of *Hydromys* been formulated apart from *Xeromys*, it would most assuredly have been somewhat as follows:—The ancestor of *Hydromys* would have been said to have been an ordinary Murine with three molars, which took to an aquatic life as *Mus fuscipes*, *Microtus amphibius*, and others have done, and that then, afterwards, as the external characters became modified for swimming, and as some water-loving substance was more and more exclusively used as food, the teeth became modified in the remarkable manner characteristic of the genus. This natural speculation, apparently quite sound in itself, is abruptly overthrown by the discovery of *Xeromys*; for that animal, without having developed the aquatic habits and characters of *Hydromys*, has already attained to the same specialized dental peculiarities. That *Xeromys* is the almost unmodified descendant of one of the more recent direct ancestors of *Hydromys* is almost unquestionable, as it does not possess a single peculiar character of its own, every one of its points being present either in its relatives the true Rats and Mice, or in what we may fairly call its offspring, *Hydromys*.

The true course of the evolution of *Hydromys* appears therefore to have been this. There would have been living in Australia, perhaps comparatively recently, one or more species of a terrestrial genus possessing a Murine exterior and skull, and Hydromyine dentition, palate-ridges, and mammæ (*i. e. Xeromys* as now defined). Some members of this genus taking to an aquatic life, such of their characters as had any direct relation to the power of swimming would have become modified, these being size, form of head, and therefore of skull, structure of muzzle (for cleaving the water and keeping it out of the mouth), great whisker development, closeness and glossiness of fur, extra folds on ear-conch, webbing of toes, suppression of sole-pads, and hairiness and increase in size and strength of tail. On the other hand, the number and structure of the teeth, and even such slight and presumably easily modified

characters as the form of the palate-ridges and the number of the mammæ, have remained quite unaffected during all the changes that the rest of the animal has undergone.

A parallel case, but one in which the differences between the two are by no means so strongly marked, is that of the rare Floridan *Neofiber*[1], in its relationship to the common and widely-spread North-American *Fiber*.

But the question next arises as to which of the Murines *Xeromys* itself is most allied; but here the very high specialization of its teeth presents the same difficulty as in the case of *Hydromys*, so that in this respect the discovery of *Xeromys* hardly helps us at all. The slight differences between the teeth of the two genera prove that the almost continuous walls round the lobes of the molars of *Hydromys* were formerly cusps, as in other Murines; but although this leads directly towards *Mus*, it leads equally directly towards nearly all the other members of the family. In fact one cannot say with absolute certainty that the teeth are more nearly allied to those of *Mus* than to those of *Uromys*, *Hapalotis*, *Gerbillus*, or even *Cricetus* itself; and we must therefore be content to wait in the hope that more of the missing links, either fossil or recent, may yet turn up, and that then a more enlightened study of larger material may tend to elucidate this most interesting question. In any case we must be thankful that by the preservation of the apparently common-looking little *Xeromys myoides*, so important an advance in our knowledge of the ancestry of *Hydromys* has been made practicable.

EXPLANATION OF PLATE XXIX.

Figs. 1–4. Skull of *Xeromys myoides*.
5. Palate-ridges of ditto.
6. Anterior zygoma-root of ditto.
7. Anterior zygoma-root of *Hydromys chrysogaster*.
8, 9. Ear and right hind foot of *Xeromys myoides*.
10–12. Left upper and lower molars of ditto.

2. On a new Tree Trap-door Spider from Brazil.

By the Rev. O. P. CAMBRIDGE, M.A., F.R.S., C.M.Z.S., &c.

[Received April 10, 1889.]

Class ARACHNIDA.

Order ARANEIDEA.

Fam. THERAPHOSIDÆ.

Gen. nov. DENDRICON.

DENDRICON RASTRATUM, sp. n.

This genus is evidently nearly allied to *Moggridgea*, Cambr., but the presence on the falces of a strong rake-like group of spines near the base of the fang, and a difference in the form of the maxillæ and labium, lead me to conclude that it is certainly distinct from that

[1] See True, P. U. S. Nat. Mus. vii. p. 170 (1884).

s. The *labium* is longer than broad, somewhat narrower at the than at the base; the apex is rather rounded, and there are

1

3

2

4

5

Structure of *Dendricon rastratum*.

Fig. 1. Labium and portion of sternum, enlarged.
2. Portion of one of the falces, enlarged.
3. Portion of one of the maxillæ, enlarged.
4. Leg of 1st or 2nd pair, enlarged.
5. Nest in bark, natural size.

erous small denticulations on the upper half. The *maxillæ* are covered with similar denticulations.

The *falces* are massive, with some sharp teeth opposed t strong, curved fang, and a compact group of spines at their mity, in front, on the upperside near the articulation of the fan

The *legs* are short, very strong, and armed with spines o tibiæ and metatarsi of the two anterior pairs. The colour o above parts is yellow-brown to rich reddish brown.

The nest consists of a short tube, covered with minute fragm of bark and lichens, and almost concealed in the interstices o bark of a tree; at the upper end is a nearly circular, hinged w lid, similarly concealed by lichens and bits of bark.

Two specimens of this nest, and the Spiders in them, were recently forwarded to me by post by Mr. Frederick Tayl Rainhill, Lancashire; but unfortunately the Spiders and the ba which the nests were placed were completely crushed and a comminuted in the postal transit, so that no part of the Sp could be distinguished excepting the fragments from which figures annexed were drawn. These fragments, however, show the Spider is nearly allied to *Moggridgea*, Cambr., but distinc have therefore thought that a new genus might be based upon t and that thus the attention of collectors being drawn to the fa there being a Tree Trap-door Spider inhabiting Brazil, more exa might be obtained, and further details of the Spider's size, form position of the eyes ascertained. The only hitherto known T door Spiders inhabiting trees have been found in South Africa.

The Spiders and nests now described were received by Mr. T from Mr. Dukinfield Jones, C.E., by whom they were found i Organ Mountains, Brazil.

3. Some Notes upon the Anatomy of the American T (*Tapirus terrestris*). By Frank E. Beddard, M Prosector to the Society.

[Received May 6, 1889.]

Having dissected two specimens of the American Tapir, I been able to supplement in some particulars the accounts giv Owen (6), Yarrell (9), Eudes-Deslongchamps (3), Mayer (11) Turner (8) of the anatomy of this animal. My notes principally to a young Tapir which died in the Society's Gardens on February of the present year, having lived in the Gardens for only two mo

The animal measured 41 inches from the tip of the snout t root of the tail (the measurement being taken along the curves o back). The height at the shoulder was 22 inches.

The animal showed the white bands which characteriz young.

Alimentary Tract.

The hard palate was furnished with 15 ridges and one incon ridge on either side which showed an alternate arrangemen

apex of each ridge lying between two ridges of the opposite side; in front of the molars these ridges are directed forwards, posteriorly they are directed backwards; on the right side the half ridge formed the fourth of the series, on the left side the fifteenth.

The *tongue* has numerous fungiform papillæ, and, as Parker (10) states of the Indian Tapir, these papillæ are most numerous anteriorly and posteriorly; a median space was entirely destitute of these papillæ, which, however, occurred along the sides of the tongue in this region just as abundantly. There was a distinct Mayer's organ, and on a level with the anterior margin of this a transverse row of four circumvallate papillæ.

On opening the abdominal cavity the greater part was seen to be occupied by the cæcum and two segments of the colon; the coils of the small intestine were pushed away to the left side. Owen describes an identical arrangement in his specimen; it may therefore be probably regarded as typical.

The *stomach* measured 21 inches round the greater curvature, it was 8 inches in length; the shape agreed with the figure given by Eudes-Deslongchamps, and with Parker's figure (10, woodcut fig. 1) of the stomach of the Indian Tapir, but the two orifices (œsophageal and duodenal) were more closely approximated owing to the tension caused by the gastrohepatic ligament. The œsophageal epithelium was found to be prolonged some way into the interior of the stomach, and was recognizable by its dense white, corrugated appearance; it extends for a distance of about $2\frac{1}{2}$ inches on one side and $1\frac{1}{2}$ inches on the other side of the œsophageal opening—not so far as in the Rhinoceros and Horse or in the American Tapir as described by Owen (6); the interior of the stomach appeared to be, in fact, much like that of the Indian Tapir. The stomach was twisted as in Eudes-Deslongchamps's figure.

The *biliary orifice* was about 2 inches from the pylorus; the *pancreatic opening* opposite to it and about 1 inch from the pylorus.

The walls of the stomach at the duodenal orifice were very thick and furnished with several circularly arranged folds; the commencement of the duodenum was well marked.

The *small intestine* measured 27 feet in length. I could not discover any *valvulæ conniventes*, only irregular folds which extended through many feet of the intestine; their folds were in some parts so complex as to produce a honeycombed appearance.

The *cæcum* and the commencement of the *large intestine* are illustrated in the accompanying drawing (woodcut fig. 1). This viscus has been already illustrated in Eudes-Deslongchamps's memoir, but the figure given by him is small and in some respects incomplete. The general appearance of the cæcum and the colic loop is very similar to that of the Horse (Chauveau (2), fig. 177, p. 432) and the Rhinoceros (Beddard and Treves (1), pl. xxxiv.). The small intestine is attached to the cæcum, as in the other Perissodactyles, by a large anangious fold (fig. 1, *b*, p. 254) extending along the small intestine for the distance of about 1 foot. Where the vein and artery perforate

Fig. 1.

Cæcum and Colic Loop of *Tapirus terrestris*.

c, cæcum; L.I, colic loop; *d*, blood-vessel running in peritoneal fold; *a*, various folds of peritoneum; *m*, mesentery supporting cæcum and s intestine; *si*, small intestine.

the intestinal mesentery on their way to and from the cæcum a small mesenteric fold (fig. 1, *a*) was attached for a short distance to the cæcum. The cæcum is thrown into sacculations by four fibrous bands running from end to end of the cæcum and at approximately equal distances from each other; of these the band to which the ileo-cæcal mesentery is attached is the least conspicuously developed. This is rather remarkable, for in the Rhinoceros (*Rh. sondaicus*) the band which lies on the *opposite* side of the cæcum has disappeared, and in the Horse is fused a considerable way before the end of the cæcum with one of the lateral bands[1].

At its commencement the *colon* was enormously enlarged and intimately bound to the cæcum by fibrous bands as in the Rhinoceros.

The looped arrangement of the colon is identical with that of the Horse and Rhinoceros; the distal narrow portion was not so distinctly marked as in Rhinoceros, but this apparent difference may be really due to inflation.

As in *Rh. sondaicus* each loop of the colon was furnished with a considerable artery (fig. 1, *d*) and vein attached by a fold of mesentery to the surface of the colon; the blood-vessels and the folds were continuous at the extremity of the loop.

The American Tapir furthermore resembles the Rhinoceros in the presence of a small free fold (fig. 1, *e*) which arises from the surface of the membrane uniting the two halves of the colic loop. As will be seen by a comparison of the accompanying drawing with the figures of the Rhinoceros's cæcum published by Mr. Treves and myself (pl. xxxiv.), this fold appears to be on the opposite side.

The *omentum* was large and bore some fat; it was fixed to the transverse colon and to the kidney.

The *spleen* measured 13½ inches in length and 3 inches greatest breadth; it had a conspicuous notch on one side near to the broad end.

The *liver* is more like Murie's figure (4, plate iv. fig. 7) of the liver of *T. indicus* than Parker's (10, woodcut fig. 2, p. 770). It has a well-developed Spigelian and caudate lobe. The right central lobe is larger than the left. There is of course no gall-bladder.

The *heart* possesses a well-developed moderator band formed of four limbs, of which three are attached to the free wall of the right ventricle and one to the septal wall. According to Parker (10) this structure does not occur in the Indian Tapir. As in that species, the subclavian and carotid arteries all arise from a single innominate trunk.

The *lungs* agreed perfectly well with Parker's description of the lungs in the Indian species. I noticed on the right side an eparterial bronchus.

The *generative organs* I did not dissect; the penis is well illustrated in Eudes-Deslongchamps's figures.

[1] Parker only describes three bands in *T. indicus*; the one that has vanished appears to be the one that is feebly developed in the American Tapir.

The following visceral characters appear to distinguish the American from the Indian Tapir:—

(1) Absence of well-marked valvulæ conniventes, or at any rate their less development (Owen).

(2) Presence of a moderator band in the heart.

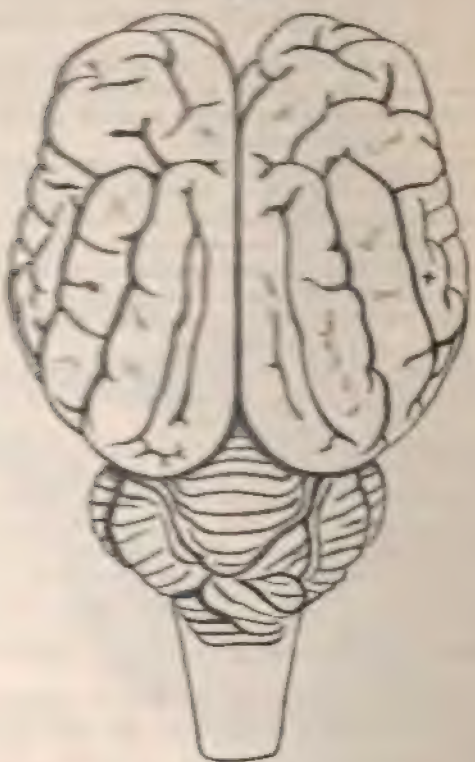
(3) Shape of glans penis.

(4) A more elongated cæcum sacculated by four bands.

Brain.

The accompanying drawings (woodcuts figs. 2, 3) illustrate the principal characteristics of the cerebral hemispheres and of the cerebellum. The brain of *Tapirus terrestris* has been already figured by Eccles-Deslongchamps (3), Mayer (11), and Dareste (12); the

Fig. 2.



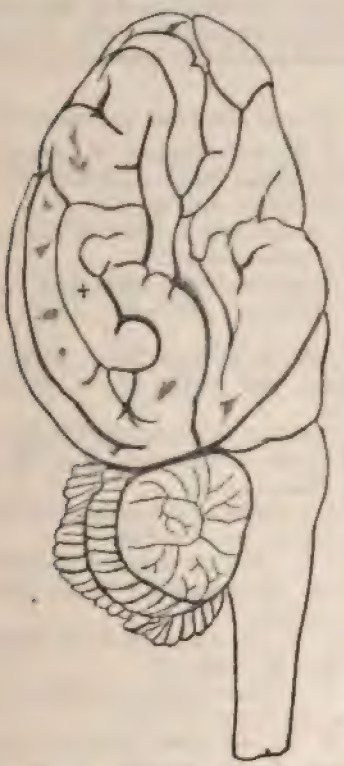
Upper surface of Brain of *Tapirus terrestris.*

second figure, that of Mayer, is also copied in Krueg's work upon the cerebral convolution of Ungulates (5). I believe, however, that my figures, which were carefully drawn by Mr. Smit from the pre-

brain, are somewhat clearer; in any case the individual
ns are well known to be very great; hence it is necessary to
e a large number of brains before the arrangements of the
hich characterize a particular species or genus can be
l.

ie time that Krueg's important memoir upon the Ungulate
as published (1879), there were but few figures of the Perisso-
section of that group; besides the Horse only the Indian

Fig. 3.



Lateral view of Brain of *Tapirus terrestris*.
e cross (+) is placed upon the same convolution as that in fig. 2.

eros and the American Tapir were at all known. At the
time we have also figures of the brains of *Rhinoceros sondaicus*
rd and Treves [1], pl. xxxvii.), *Ceratorhinus sumatrensis*
[7], pl. lxx.), *Tapirus indicus* (W. N. Parker [10], pl. lviii.),
the additional figures of *Tapirus terrestris* which are given
paper. It seems therefore to be now more permissible to
the American Tapir with its allies than when Krueg wrote.

There seems to be no doubt that the cerebral convolutions are simpler in *Tapirus* than in the other types; on the other hand, it is well known that the brains of smaller animals are more simple in their convolutions than those of their larger allies. This generalization, however, hardly applies to the Perissodactyla; *Ceratorhinus sumatrensis*, as Garrod has pointed out, has a more complex and folded cerebrum than the larger *Rh. unicornis*; the brain of *Rh. sondaicus* is if anything rather more complex than that of *Rh. unicornis*, though here, again, the contrary might have been expected. The brain of the Horse is at least as complicated in the cerebral folds as that of Rhinoceros. It may therefore be that the comparatively simple brain of the Tapir is an indication of a low position among the Perissodactyla, which is of course favoured by other considerations.

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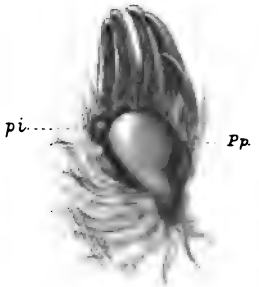

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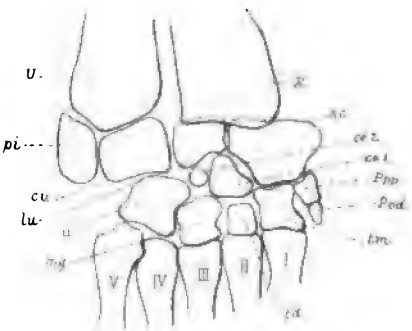

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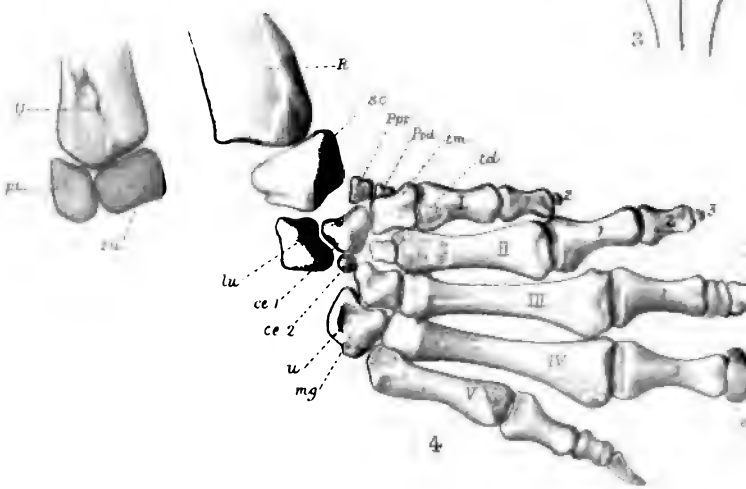

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G M Woodward del et lith.

Præ pollex & præ hallux of Mammals

4. On the Præpollex and Præhallux, with Observations on the Carpus of *Theriodesmus phylarchus*. By Prof. Karl Bardeleben (Jena). (Communicated by Prof. G. B. Howes, F.Z.S., F.L.S.)

[Received April 30, 1889.]

(Plate XXX.)

In 1885 I gave the name "rudiments of præpollex and præhallux" to those bones on the inner side of the carpus and tarsus of the Mammalia which were hitherto either quite unknown, or had been but briefly described as radial and tibial "sesamoids." I have found these bones in all orders of Mammals which have five functional digits. The "rudiment of the præpollex" (shortly called "præpollex") is present in Marsupials, Edentata, Rodents, Insectivora, Carnivora, and Monkeys. The præpollex is situated on the trapezium in Insectivora and Lemurs; between the scaphoid and the first metacarpal in Rodents and Carnivora; between the scaphoid and the trapezium in Monkeys. The præhallux articulates with the first cuneiforme in Marsupials, Insectivora, and some Carnivora; with the same bone, or with the navicular, in Edentata and Rodents; with both bones in other Carnivora; between the first cuneiform and the first metacarpal in Monkeys. The rudiments of the præpollex and præhallux are small, rounded, or elongated ossicles, often strikingly similar to a metacarpal or phalangeal bone. As almost all Mammals have also a supernumerary bone (formerly considered as a "sesamoid") on the *outer* side of the hand (pisiforme) and of the foot (tuberositas calcanei), I conclude (regarding these supernumerary elements as vestiges of reduced digits) that there are, in addition to the ordinarily recognized five digits, the rudiments of a sixth (internal) and of a seventh (external) digit, in both the hand and foot of Mammals.

I have also found a supernumerary cartilage on the tibial border of the tarsus in the human embryo of the second month; and Kehrer, a pupil of Wiedersheim, has shown (Berichte d. naturf. Gesellsch. zu Freiburg, Bd. i. Heft 4, 1886) that the *Urodela* have also rudiments of seven digits in embryonic stages. Consequently I was led to state, at the meeting of the German Naturalists and Physicians in Berlin (1886), that we must modify our former views on the pentadactyly of the higher vertebrates, inasmuch as we have ground for regarding certain cases of hyperdactyly (polydactyly), which are not unfrequently found in Mammals (more especially in the best-known Mammal, Man), as instances of *atavism* rather than of abnormality.

Until this month I have neither had the time nor the requisite material for a more detailed inquiry into this important subject, nor had I seen the large collections of London and of North America. My intention to come to London has been on several

occasions frustrated. In the meantime, many observations agreeing with my own have been recorded by other authors; and there has been a strong attack made upon my views by Prof. Gegenbaur (Morphol. Jahrbuch, vol. xiv. p. 394, 1888).

This attack, emanating from one of the most celebrated comparative anatomists of the day, impelled me to renew my investigations on the subject and, for this purpose, to study the collections preserved in the British Museum, where I have found both a very large amount of material and have met with the greatest kindness in helping me to use it. Of those to whom I am particularly indebted, I may mention Prof. Flower, Dr. Günther, Dr. Woodward, Mr. Boulenger, Mr. Lydekker, and especially Mr. Oldfield Thomas, who allowed me to work in his room, and who gave me much assistance in my examination of the Museum specimens.

These recent observations have fully corroborated my previous conclusions on the subject. Although it is not possible for me just now to communicate all the results I have obtained in London, I may nevertheless give a short account of some of the more interesting facts which I have established.

In some Mammals (for example, in *Pedetes capensis*) the præpollex consists of *two* bones (Plate XXX. fig. 2), of which, in a specimen in the British Museum, the proximal (*Pp.p.*) is 13 millim. long, and the distal (*Pp.d.*) 7 millim. And, above all, this rudiment of a digit bears, in this animal, a *genuine nail*[1]; whereas many true digits, such as the halluxes of Marsupials, are without nails. The præpollex of *Pedetes* is very large, and the nail is a true one, singularly like that of the human thumb and similarly longitudinally striate (Plate XXX. fig. 1).

In *Bathyergus maritimus* (Plate XXX. fig. 3) the præpollex and the postminimus are both very well developed. The latter consists of *two* bones, of which the proximal (*pi.p.*) is the true pisiform and measures 5 millim. in length, while the distal (*pi.d.*) is 7·5 millim. in length. We must therefore in the future distinguish a proxima[l] from a distal "pisiform;" and I regard the former as, in all proba[-]bility, the carpal, and the latter as the metacarpal segment of th[e] postminimus.

If, with the carpus or tarsus of an animal with five digits, ther[e] articulate one or two supernumerary bones having the form an[d] relationships of those ordinarily representing a reduced pollex o[r] hallux, we have good reason for regarding the same as rudiments o[f] a digit. It is most difficult, however, to say wherein a digit consist[s]. How many bones must it contain? Is the mammalian thum[b] invariably a complete digit, or is it only a rudiment? If it is [a] digit, the præpollex and præhallux are digits too, at least in th[e] cases of *Pedetes*, *Talpa*, and many others. Everybody who h[as]

[1] Mr. Oldfield Thomas, to whom I had shown the two bones in the p[re]pollex, examined for me the skins of this animal which are preserved in [the] collection, and found the nail in question. Prof. Howes has since inform[ed] me that a similar, but less specialized, cornification overlies the immense p[re]hallux of *Cercolabes* (*C. novæ-hispaniæ*).

studied these matters, and has compared the different degrees of reduction in the mammalian hand and foot, will admit that not only the reduction from five to four, three, two, and even one digit is possible, but equally the reduction from seven to six, and from six to five.

I have also found in many Reptiles the rudiment of a præpollex and a præhallux, although most of these animals are much differentiated. We shall probably never find either in Mammals or in Reptiles (*Ichthyosaurus* excepted) seven equally developed digits; but nobody will deny that a great many forms are lost for ever, and that we have little chance of finding complete fossil remains of digits in animals whose hands and feet were wholly or partly cartilaginous, as is the case with most Amphibia.

I have also found the præpollex in an animal the position of which among the Vertebrata is very doubtful; I refer to the Mesozoic *Theriodesmus phylarchus* of Seeley (Phil. Trans. vol. 179, B, 1888, p. 141). There is preserved in the British Museum a natural mould of the bones of the right forearm and hand of this animal, together with other fragments of its skeleton. Prof. Seeley's description appears to me to be inexact, and I cannot agree either with his views or with his restoration of the carpus. He considers that there are *three* centralia. His first centrale is, as my reconstruction shows (*cf.* Plate XXX. figs. 4 & 5), the lunar; his third centrale, on the border of the scaphoid ("scapho-lunar" of Seeley) and the trapezium, is the proximal bone of the præpollex; and his second centrale appears to me to consist not of *one* bone, but of *two*, *i. e.* two centralia. The first[1] centrale has the same position as in all Mammals in which it is a distinct bone; he second is placed as in the carpus of *Centetes* (in which it is not quite distinct),—and as in the tarsus of *Cryptoprocta ferox* (Madagascar; Leyden Museum), in which I have found a distinct bone (triangulare tarsi). A small ossicle (small, perhaps, only in the plane in which the stone has been cleft) lies on the border of the trapezium; it has been omitted by Prof. Seeley in his diagrams (*l. c.* pp. 147 and 150), and is in reality the distal bone of the præpollex (*Pp.d.*).

Figure 4, which I have had redrawn from the original specimen, also shows some other interesting points. The unciform (*u.*) bears a condyle for articulation of the fourth, and a fossa for that of the fifth metacarpal bone. Between the first and second, and also the second and third phalanges of the third finger, and between the first and second phalanx of the fourth finger (the end of which cannot be clearly made out), there are intermediate pieces of bone which are probably epiphyses. In the other fingers these intermediate bones are coalesced with the phalanges in the same manner as the epiphyses of other Mammals. If these intermediate bones are epiphyses, the phalanges of the third and fourth fingers of this animal would appear to bear epiphyses at both ends—a condition rarely seen among Mammals.

[1] I enumerate the centralia from the radial or tibial border, as is customarily done in dealing with the digits and the metacarpal and metatarsal bones.

The radius and the ulna of *Theriodesmus* are of a simple generalized type, in some points resembling those of Reptiles; but the olecranon has more or less mammalian characters.

So far as this specimen carries us, *Theriodesmus* cannot be said to belong to any known order of Mammals, but it is also not a Reptile in the modern sense of the word. This animal shows, in its forearm, its caudal vertebræ, and its centralia, such very low (although mammalian-like) characters, that it ought to be placed between the Reptiles and Mammals. If not the "Promammal" of Haeckel, it may perhaps have been a near relative of some such transitional form, whose existence and characters may be thus postulated on retrospection.

EXPLANATION OF PLATE XXX.

Præpollex and Præhallux of Mammals.

Figs. 1, 4, 5, nat. size. Figs. 2 & 3, slightly enlarged.

Fig. 1. Right manus of *Pedetes capensis*, palmar surface.
2. The supporting skeleton of the same.
3. The supporting skeleton of the corresponding manus of *Bathyergus maritimus*.
4. Right manus of *Theriodesmus phylarchus*, Seeley.
5. Restoration of the carpus of the same.

Reference letters.

ce^1., *ce*.^{2}, centralia. *cn.*, cuneiforme. *ep.*, epiphysis. *lu.*, lunare. *mg.*, magnum. *pi.*, pisiform (postminimus). *pi.d.*, distal bone of pisiform. *pi.p.*, proximal bone of pisiform. *Pp.*, præpollex. *Pp.d.*, distal bone of præpollex. *Pp.p.*, proximal bone of præpollex. *R.*, radius. *Sc.*, scaphoid. *td.*, trapezoid. *tm.*, trapezium. *u.*, unciforme. *U.*, ulna. I, II, III, IV, V, metacarpals. 1, 2, 3, phalanges.

May 21, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited and made remarks on the mummy of a Falcon which had been obtained at Thebes in Egypt by Mr. Arthur J. Scott, F.Z.S., last winter. It was believed to be that of a Kestrel (*Tinnunculus alaudarius*).

Mr. Sclater exhibited and made remarks on a series of photographs, taken at Antipodes Island, south of New Zealand, by Messrs. Dougall, of Invercargill, New Zealand, and representing groups of the marine birds (Penguins, Cormorants, and Albatroses), and of the Sea-lions, which frequent that island for breeding-purposes.

Mr. Sclater exhibited a drawing of a Leaf-insect living in the Society's Insect-house, and probably referable to a not quite adult stage of *Phyllium gelonus*, Gray. This specimen has been received

Phyllium gelonus, imm.

from the Seychelles and presented to the Society by Lord Walsingham, F.R.S.

The following papers were read:—

1. List of the *Crioceridæ, Cryptocephalidæ, Chrysomelidæ,* and *Galerucidæ* collected in Venezuela by M. Simon, with Descriptions of the new Species. By Martin Jacoby, F.E.S.

[Received April 24, 1889.]

A collection of Phytophagous Coleoptera from Venezuela has been kindly submitted to me by Mons. Eug. Simon, of Paris, for examination, and, as far as I am able, I herewith give the results, although a good many small species have been left undetermined for want of

material, as descriptions from single specimens (unless particular distinguished in one way or other) are not desirable, taking in consideration the variability of the Phytophaga.

Perhaps it is not out of place here to caution future collectors these insects against the practice of gumming them on small piec of cardboard, since it is in most cases necessary to examine t undersides of the specimens. These suffer greatly during relaxatio and are in many instances almost impossible to clean so that t small spines and structures of the legs and antennæ shall be ma plainly visible. The specimens should in all cases be sent home sawdust and left to be mounted in one way or other after they ha been examined.

I add here the localities in which M. Simon obtained the spe mens :—

La Guaira (level of the sea), October 1887.

Caracas (elevation of 922 metres), October till January 1888.

Colonia Tovar, Province Guzman Blanco, mountains of 19 metres at an average.

Hacienda de Corosal, near Caracas, February 17th–21st.

Puerto Cabello (level of the sea), February 27th–29th and Marc

San Esteban, hot forest near Puerto Cabello, March 1st–26th.

Valencia, March 29th till April 6th.

The collection, although not large, contains a good many app rently undescribed species; those which are known are for the mo part also found in Colombia and other parts of South Americ very few collections have to my knowledge been sent from Ven zuela, which offers no doubt a rich field to the Entomologist.

LEMA PATRUELIS, n. sp.

Head, the antennæ (the three apical joints excepted), the brea and the four anterior legs black ; thorax fulvous, impunctate ; ely flavous, a transverse band at the base and another below the mid black ; posterior femora flavous.

Length 3 lines.

Head black, impunctate, eyes deeply notched ; antennæ extendi to half the length of the elytra, black, the apex of the ninth a the two apical joints entirely fulvous ; thorax slightly broader th long, dark fulvous, the sides deeply constricted, the basal sulcati distinct, the surface entirely impunctate ; scutellum black : ely scarcely perceptibly depressed below the base, the anterior porti distinctly, the posterior one very finely punctured, the interstices fl the lateral margin raised ; the disk flavous, interrupted by a bro bluish-black band at the base, extending to the sides, having posterior edge sinuate, and by another transverse band placed ne the apex, not quite extending to the extreme margin ; this band h its upper margin convex near the sides but narrowed towards t suture, and its lower margin slightly concave : the breast and t four anterior legs (a flavous spot at the underside of the femo excepted) black ; abdomen and the posterior femora fulvous, t extreme apex of the latter and the tibiæ and tarsi black.

San Esteban. A single specimen.

Allied to *L. ducalis*, Lac., *L. buckleyi*, Baly, and many others, but differing from all in the system of coloration.

LEMA SIMONI, n. sp.

Fulvous; antennæ (the first joint excepted), the apex of the tibiæ, and tarsi black; thorax with three piceous spots, punctured on the disk; elytra strongly punctured anteriorly only, the ninth row entire; abdomen stained with piceous.

Length 2½ lines.

Head constricted behind the eyes, the latter very prominent, deeply notched; the vertex impunctate, the lateral grooves very deep; palpi thickened, piceous; antennæ not extending to half the length of the elytra, black, the basal joint fulvous, the second very short, the third slightly shorter than the fourth joint; thorax not longer than broad, not very deeply constricted at the sides; the basal sulcation shallow and only visible when viewed sideways, the surface with a double row of fine punctures down the middle, the sides anteriorly, and a longitudinal stripe at the middle, piceous; scutellum piceous, with a basal fovea; elytra without any basal depression, strongly punctured at the base, the punctures gradually diminishing posteriorly and scarcely visible at the apex, the interstices very slightly convex at the latter place and at the sides, also impressed here and there with a few fine punctures; underside and legs fulvous, the extreme apex of the tibiæ, the tarsi, and the middle of the abdominal segments piceous.

San Esteban. A single specimen.

Allied to *L. nupta*, Lac., and several others belonging to that division, but differing in the colour of the antennæ, that of the thorax, and in the immaculate elytra.

LEMA EQUESTRIS, Lac.

A single specimen obtained at San Esteban agrees almost entirely with the Mexican forms.

LEMA CALCEATA, Lac.

I refer somewhat doubtfully the three specimens from San Esteban to this species, with the description of which they agree in the main points; the antennæ may, however, be called rather robust, and the elytra, which show an oblique depression at the base (of which Lacordaire says nothing), are not finely but very deeply punctured, and the interstices here and there transversely raised; everything else agrees with the author's description, and as there are already several very closely allied species contained in Lacordaire's 32nd group, I have preferred not to describe the present insect as another addition to it.

LEMA DUBIA, Lac.

From San Esteban and Puerto Cabello.

Lema sagittifera, Lac.
From Corosal.

Lema orbignyi, Lac., or L. dorsalis, Lac.
Specimens from Caracas may be referred to either of these speci
one of which is probably a variety of the other.

Megascelis herbacea, Lac.
San Esteban.

Megascelis vittata, Fabr.
Corosal.

Megascelis suturalis, Lac.
San Esteban.

Megascelis amabilis, var., Lac.
Colonia Tovar.

Cryptocephalus atomaroides, Suffr.
Colonia Tovar. A single specimen.

Cryptocephalus obfuscatus, Suffr.
Colonia Tovar. A single specimen.

Cryptocephalus decorus, Suffr.
A single specimen from Colonia Tovar.

Cryptocephalus anceps, Suffr.
La Guaira and Caracas.
This species has been described by Suffrian as inhabiting Cuba
well as Caracas. The specimens obtained by M. Simon agree ve
nearly with the author's description, which gives the ground-colo
of the elytra as brown, interrupted by three transverse yellow band
in the Venezuelan specimens the yellow colour predominates, a
is divided by a narrow transverse brown band before and a simi
band below the middle; these bands are irregularly indented a
connected by the brown punctured striæ, which separate the yell
ground-colour. I have not seen a typical specimen of *C. ance*
but I have not much doubt about the present insects being identi
with it, being probably subject to variation in regard to the yell
or brown colour.

Cryptocephalus auratus, Fabr.
Seven specimens from Corosal and Colonia Tovar.

Monachus peccator, Suffr.
Corosal and Colonia Tovar.

Pachybrachys reticulatus, Fabr.
Caracas. A single specimen.

DORYPHORA PUNCTATISSIMA, Stål.

A single specimen from San Esteban.

DORYPHORA PURA, Stål.

San Esteban and Colonia Tovar.

DORYPHORA MACULATA, Oliv.

San Esteban.

DORYPHORA BLANDA, Stål.

San Esteban.

DORYPHORA SIMONI, n. sp.

Obscure brownish æneous; thorax strongly transverse, the sides with a few punctures only; elytra flavous, very finely subgeminate, punctato-striate; the margins, a deeply dentate transverse band at the base (including a flavous spot), another band at the middle, and two elongate spots near the apex, piceous.

Length 4½ lines.

Of very rounded, strongly convex, and posteriorly deflexed shape; head, thorax, and the underside brownish, with greenish æneous reflections, the head finely punctured; the labrum fulvous; antennæ greenish black, the first joint fulvous, the third very elongate, the following very short, the terminal five joints gradually widened; thorax at least three times broader than long, the sides very strongly rounded and widened before the middle, the surface entirely impunctate, with the exception of a few deep punctures at the sides, the latter also with a round fovea; scutellum impunctate, brownish: elytra widened towards the middle, the anterior portion strongly convex, the posterior greatly and rather suddenly deflexed; the disk very finely punctured, the punctures irregularly arranged here and there in double rows, flavous; the bands not extending to the lateral but to the sutural margin, the basal one consisting of four connected elongate spots, joined at the middle to the base so as to enclose a round spot of the ground-colour near the scutellum; the second band placed at the middle, also composed of four confluent spots, two other elongate spots near the apex, and a short streak attached to the suture near the apex, as well as all the margins narrowly, brownish piceous; the mesosternal process strong, straight, and moderately long.

San Esteban; a single specimen.

DORYPHORA FASCIATA, Stål.

A specimen from San Esteban.

PROSICELA CHEVROLATII, Baly.

San Esteban and Colonia Tovar.

CALLIGRAPHA PERCHERONI, Stål.

San Esteban and Colonia Tovar.

Desmogramma decorata, n. sp.

Obscure fulvous; terminal joints of the antennæ black; t
remotely punctured; elytra regularly punctate-striate, flavo
sutural band, divided anteriorly, the posterior part of the
margin, and two elongate markings before and below the m
connected by a narrow stripe, brownish æneous.

Length 3 lines.

Head with some fine punctures, fulvous, slightly stained
æneous; antennæ short, the five terminal joints widened, blac
others fulvous; thorax nearly three times as broad as long, th
straight, the anterior and posterior margin nearly parallel; th
rather strongly and irregularly punctured near the middle and
sides, leaving a narrow central impunctate space, fulvous,
slight metallic greenish tint; elytra flavous, with a narrow
tudinal sutural band of brownish-æneous colour extending
second row of punctures, and divided in front at each side
suture into a short branch which does not extend to the ba
subquadrate large spot is placed directly below the base and
nected at its inner margin by a narrow stripe with anothe
triangular spot placed near the apex; the posterior portion
lateral margin is likewise brownish; below obscure fulvou
legs paler; claws simple; the prosternum longitudinally
between the anterior coxæ.

San Esteban. A single specimen.

The elytra have the third and fourth rows of punctures inter
before the apex, the fifth, sixth, and seventh rows slightly i
the spots are of a greenish-æneous colour.

Plagiodera ornata, n. sp.

Pale fulvous; the terminal joints of the antennæ, the knee
the tarsi black; thorax with a narrow central black line an
basal spots; scutellum black; elytra semiregularly punctured
taceous, the suture and six spots on each elytron (1, 2, 2, 1) n
green.

Length 2–2½ lines.

Head impunctate, depressed between the eyes; antennæ
the basal five joints fulvous; thorax three times broader than
the sides straight at the base, slightly rounded in front; th
impunctate, with a narrow central black line from the base
apex, the basal margin with two black spots; elytra testaceo
punctures placed in irregular rows, a broader space in front
lateral margin depressed, darker fulvous, and bounded by a
deeper punctures, the suture narrowly metallic green, this
widened at the apex into a rounded spot; six other green
placed as follows—a small one on the humeral callus, two
ones placed transversely before and two others below the midd
a single spot at the apex; below and the legs fulvous, the kne
tarsi black.

San Esteban.

Of this handsome species two specimens were obtained.

HERMÆOPHAGA SIMONI, n. sp.

Piceous; the antennæ (the terminal joints excepted), thorax, and legs flavous; elytra greenish æneous, finely and semiregularly punctured.

Length ¾–1 line.

Head piceous, impunctate, the vertex with a metallic æneous tint, the space between the eyes more or less flavous; the tubercles obsolete, very narrowly transverse; labrum black; antennæ closely approached, extending beyond the base of the elytra, flavous, the four terminal joints black, the basal joint narrowly elongate, second short and thickened, the following two joints scarcely longer but more elongate; thorax twice as broad as long, the sides straight, the anterior angles obliquely angulate, the posterior margin produced at the middle into a rounded lobe, the surface with a deep transverse groove near the base, slightly sinuate in shape and bounded laterally by a short longitudinal depression, beyond which the groove is extended at a little distance along the sides; the disk entirely impunctate, flavous; scutellum small, black; elytra convex, widened towards the middle, the base with a very shallow obsolete depression, metallic greenish or æneous with a slight flavous tint, the punctuation fine and close, more distinct at the base than towards the apex and arranged in somewhat regular rows near the base; legs flavous; posterior femora strongly incrassate; tibiæ armed with a very minute spine; the first joint of the posterior tarsi as long as the following two joints together; claws appendiculate.

Caracas.

HERMÆOPHAGA SUBCOSTATA, n. sp.

Metallic dark blue; the three basal joints of the antennæ flavous; thorax transverse, entirely impunctate; elytra strongly and deeply semipunctate-striate, the sides with one or two more or less distinct longitudinal costæ.

Length 1¼–1½ line.

Head broad, impunctate; eyes very large; the frontal elevations distinctly raised, rather short and trigonate, the carina very short and obscure; labrum piceous; palpi fulvous; antennæ half the length of the body, black, the lower three joints fulvous, the basal one stained with metallic blue above, the third joint quite as long as the fourth; thorax strongly transverse, more than twice as broad as long, the sides nearly straight, the anterior angles oblique, slightly thickened; the disk slightly swollen in front, with a very deep and sinuate transverse groove near the base, bounded at the sides by another perpendicular groove, beyond which the basal groove extends to a slighter degree upwards along the sides, the surface entirely impunctate; elytra convex, with strongly impressed and closely placed rows of punctures, the sides with a short acute ridge commencing at the shoulder and extending below the middle, this ridge much more strongly marked in the female.

Caracas.

I think that this species is distinct from its many closely allied

congeners, partly described under the generic name *Diphaulaca*, o
account of the strongly punctured elytra and their lateral costa.

HERMÆOPHAGA HAROLDI, n. sp.

Metallic green; antennæ (the basal joints excepted) and ta
black; thorax broader than long, impunctate; elytra strong
punctate-striate.

Length 1½ line.

Head impunctate, the frontal elevations very distinct and of long
tudinal shape; the carina short and acute; antennæ extending
rather more than half the length of body, the lower three join
fulvous, the first stained with black above, the third slightly long
and much thinner than the second, the others black; thorax abo
one half broader than long, the sides nearly straight, the angl
acute, the transverse basal groove very deep and curved at the middl
bounded by an equally deep lateral longitudinal groove, rest of th
surface very shining and impunctate: elytra convex and very slight
widened posteriorly, the shoulders prominent, the base rather swolle
the disk strongly and rather regularly and closely punctate-striat
the punctures more strongly impressed at the sides, where the inte
stices are also rather swollen; the punctuation distinct to the ape

From Tolonia Tovar, Caracas (5 specimens).

H. haroldi, although closely allied to several species described b
von Harold under the generic name of *Diphaulaca* in his 'Coleopter
Hefte,' seems to differ principally in the strongly punctured elytra
connexion with the transversely-shaped thorax. I am in possessio
of most of the types of the author, all of which differ in this respe

HERMÆOPHAGA NITIDICOLLIS, n. sp.

Below piceous; above metallic greenish æneous; the basal joi
of the antennæ and the tarsi obscure fulvous; thorax impunctat
elytra finely and closely semipunctate-striate.

Length 1 line.

Head impunctate; eyes very large; frontal elevations strong
raised, the carina long and very narrow; anterior margin of t
clypeus swollen, perfectly straight; antennæ nearly as long as t
body in the male, shorter in the female, piceous, the three ba
joints obscure flavous, the third scarcely longer than the second b
thinner: thorax about one half broader than long, the sides straig
the anterior angles oblique, forming a small tooth before the midd
the posterior margin with its median lobe slightly produced a
rounded; the surface with a deep and strongly sinuate transve
gooove near the base, bounded laterally by a not very distinct lon
tudinal groove, but continued beyond this in a more feeble deg
along the sides of the thorax; the disk entirely impunctate and ve
shining; elytra convex, with a scarcely visible depression below t
base, finely but very closely and semiregularly punctured; anter
tibiæ with a small spine.

Caracas.

Differing from *H. nitidissima*, Baly, in the dark greenish æneo

colour, the shape of the thorax, and the close and distinct elytral punctuation.

HALTICA (GRAPTODERA) TRANSVERSICOLLIS, n. sp.

Black; antennæ and legs fulvous, above metallic green; thorax transverse, the basal groove obsolete; elytra very finely and closely punctured.

Length 1 line.

Head broader than long, very minutely granulate, impunctate, the frontal tubercles obsolete; antennæ robust, fulvous, half the length of the body, the second joint thickened, the following ones nearly of equal length but thinner; thorax twice as broad as long, the sides rounded, the angles obtuse, the surface scarcely perceptibly punctured, with a narrow transverse very obsolete groove near the base; scutellum black; elytra very finely and closely but more distinctly punctured than the thorax; legs entirely fulvous.

Colonia Tovar.

This very small species may be known principally by the more than usual transversely-shaped thorax, in connexion with the fulvous antennæ and legs and the obsolete transverse thoracic groove, which is almost invisible at the sides. On account of these characters, the Venezuelan species has scarcely the general appearance of a true *Haltica* or *Graptodera*; I see, however, no reason to separate it from that genus.

HALTICA PLICATULA, Erichs.

San Esteban.

HALTICA AMETHYSTINA, Oliv.

San Esteban and Colonia Tovar.

LACTINA AGILIS, Harold.

Colonia Tovar.

LACTICA BIFASCIATA, Jacoby.

San Esteban and Caracas.

LACTICA BOGOTANA, Harold.

Colonia Tovar.

LACTICA CITRINA, Harold.

San Esteban.

LACTICA SCUTELLARIS, Oliv.

San Esteban and Caracas.

LACTICA DICHROA?, Harold.

San Esteban.

DISONYCHA TRIFASCIATA, Clark.

San Esteban.

Disonycha austriaca, Schauf.

San Esteban.

Disonycha glabrata, Fabr.

La Guaira and San Esteban.

Disonycha lævipennis, n. sp.

Testaceous; the antennæ, apex of the tibiæ, and the tarsi black; thorax impunctate; elytra purplish blue, impunctate.

Length 2 lines.

Head impunctate, testaceous, with a single deep fovea near the inner margin of the eyes; the frontal elevations absent; the clypeus broad and but little raised; antennæ short and robust, entirely black, the first joint testaceous below, the fourth longer than the third, this latter distinctly longer than the second joint; thorax transverse, nearly three times broader than long, pale testaceous, entirely impunctate, with an obscure transverse depression near the base, the posterior angles oblique; scutellum much broader than long, piceous; elytra entirely impunctate, purplish blue; underside and legs testaceous; the tibiæ (their base excepted) and tarsi black.

Caracas. A single specimen.

D. lævipennis seems allied to *D. eximia*, Harold, from which it differs in the colour of the antennæ and in the presence of a thoracic groove. *D. steinheili* is another closely allied species, but has the vertex of the head æneous and the basal joints of the antennæ pale. The elytra in *D. lævipennis*, although impunctate, are unevenly rugose, but it is possible that in the specimen obtained this is abnormal or accidental.

Systena 8-littera, Linn.

Caracas.

Epitrix fulvicornis, n. sp.

Black; thorax and legs, the posterior femora excepted, flavous; thorax very strongly punctured; elytra with the base swollen, deeply punctate-striate.

Length $\frac{1}{2}$ line.

Head piceous, impunctate; the frontal tubercles forming narrow oblique ridges; antennæ flavous, the third and fourth joints equal; thorax nearly twice as broad as long, rather convex, the sides nearly straight, the anterior angles oblique, the surface deeply and rather closely punctured, with a slight bronze tint, the median lobe strongly produced and rounded; the sulcation not very deep, except at the sides, slightly sinuate, the space below it more remotely punctured: elytra with the basal portion strongly raised, the latter bounded below by a transverse groove, the punctured rows deep and regular, visible to the apex; the interstices costate at the sides, clothed sparingly with a few hairs.

San Esteban and Caracas.

E. fulvicornis seems to differ from its rather numerous congeners

by the strongly punctured thorax in connexion with the raised basal portion of the elytra and the flavous antennæ and legs.

EPITRIX VENEZUELENSIS, n. sp.

Elytra flavous; thorax transversely subquadrate, the basal sulcation deep and finely punctured; elytra with the basal portion slightly raised, distinctly punctate-striate, the punctures distinct to the apex.

Length 1 line.

Head impunctate, the frontal elevations rather obsolete, elongate; antennæ more than half the length of the body, entirely flavous, the terminal joints gradually thickened; thorax about one half broader than long, the sides straight, slightly narrowed towards the base, the basal margin moderately produced at the middle; the disk not visibly punctured, except below the basal sulcation, which latter runs parallel with the posterior margin; elytra with the basal portion slightly raised, the punctures very distinct to the apex, each puncture surrounded by a piceous ring.

Colonia Tovar; two specimens.

E. venezuelensis seems closely allied to *E. flavicola*, Har., from Colombia, but that species is described as having an entirely smooth thorax and the elytra without raised basal portion and their punctuation invisible below the middle; both species agree, however, in the entirely flavous colour.

EPITRIX HIRTULA, Harold.

EPITRIX OPACICOLLIS, Har.

Both species from Colonia Tovar.

EPITRIX FLAVEOLA, Har.

From Valencia.

HOMOPHYLA VARIABILIS, Jac.

Caracas.

HOMOPHYLA ADUSTA, Har.

San Esteban and Colonia Tovar.

SANGARIA HAROLDI, n. sp.

Elongate, black; head, thorax, and legs fulvous; thorax finely punctured; elytra metallic dark green, closely punctate-striate.

Length 1½ line.

Head extremely minutely punctured, the frontal elevations united at the base; the carina short and acutely raised; eyes large; palpi piceous; antennæ two thirds the length of the body, black, the second joint short, the third distinctly longer; thorax quite one half broader than long, the margins nearly straight, the angles thickened, the posterior ones oblique, the surface very minutely punctured, with a transverse narrow groove close to the posterior margin; scutellum black; elytra narrowly elongate, the base distinctly raised, strongly and closely punctate-striate, the punctures gradually diminishing

posteriorly, the interstices slightly convex; underside black; legs fulvous, the posterior tibiæ sometimes piceous; anterior coxal cavities closed.

From Corozal.

Although I have not much doubt that I am rightly referring the present insect to von Harold's genus, there are differences to be found which are rather important from a structural point of view; thus in *S. haroldi* the antennæ have the third joint nearly twice as long as the preceding, instead of these joints being both extremely short; the posterior femora also do not extend beyond the abdomen as in the type, and the posterior tibiæ are distinctly channelled near the apex: as, however, all other characters, including the thoracic groove placed closely to the margin, the closed cavities and other details, agree well with the description of that author, the above-mentioned differences are doubtless more specific than generic. From *S. haagi*, *S. haroldi* is well distinguished by the transversely shaped, not quadrate, thorax and the black underside.

CREPIDODERA CASTANEA, n. sp.

Dark brown; antennæ and legs flavous; thorax subquadrate, strongly punctured; elytra regularly punctate-striate, the interstices costate at the sides.

Var. above paler brown.

Length ¾–1 line.

Head impunctate, the frontal tubercles small but distinct, the lower part of the face rather deflexed and flattened, nearly smooth; palpi flavous; antennæ slender, nearly two thirds the length of the body, entirely flavous, all the joints with the exception of the second of nearly equal length; thorax one half broader than long, the sides concave, the angles acute, the surface rather convex, with a not very deep transverse sulcation near the base, which is not bounded laterally by a longitudinal groove, but extends upwards a short distance along the sides, the disk strongly punctured; elytra convex, pointed at the apex, the basal portion distinctly raised, regularly and rather strongly punctate-striate, of a uniformly dark brown colour like the head and thorax; legs entirely flavous; the first joint of the posterior tarsi as long as the three following joints together; anterior coxal cavities closed.

San Esteban.

This very small species seems to be allied to *C. pleuralis*, Har., from Bogota as regards the non-limited thoracic groove; the shape of the thorax and the dark uniform brown colour of the upper surface will help to distinguish *C. castanea* from its allies.

CACOSCELIS (?) SEMIFULVA, n. sp.

Reddish fulvous; the antennæ, the apex of the femora, and the tibiæ and tarsi black; thorax impunctate; elytra metallic blue, extremely closely and finely punctured.

Length 2 lines.

Head impunctate, transversely grooved between the eyes; the

frontal elevations distinct; the clypeus broadly triangular; the palpi more or less piceous; antennæ extending below the middle of the elytra, black (the basal two joints sometimes obscure fulvous), the fourth joint distinctly longer than the third; thorax subquadrate, the sides widened before the middle, rather suddenly narrowed in front, the anterior angles slightly produced outwards, the surface impunctate, shining, reddish fulvous with a very obsolete transverse depression near the basal margin, the latter straight; scutellum fulvous; elytra somewhat depressed along the base at the suture, metallic dark blue, very closely and finely punctured; the breast and legs fulvous; the abdomen, the apex of the femora, and the tibiæ and tarsi black; posterior femora but very moderately dilated, the tibiæ with a small spine, the first joint of the posterior tarsi longer than the three following joints together; claws appendiculate; anterior coxal cavities open.

San Esteban.

It is difficult to point out the exact place of this insect, which I have only provisionally placed in *Cacoscelis*; it is probably the representative of a new genus, should other species with similar structural characters be found; the thorax is nearly quadrate, not transverse as in *Cacoscelis*; all the tibiæ are marked with a small spine, and the metatarsus of the posterior legs is also much longer than in the typical forms of the genus; the posterior femora are but moderately dilated and the general shape of the insect is narrowly elongate; the long first joint of the posterior tarsi separates the species from those composing the genus *Haltica* (*Graptodera*).

APHTHONA REGULATA, n. sp.

Oblong, dark violaceous blue; the basal joints of the antennæ and the anterior legs more or less fulvous; thorax impunctate; elytra regularly punctate-striate.

Length 1 line.

Head impunctate; the frontal elevations transverse, distinct; carina acute and long; antennæ not extending to half the length of the elytra, black, the four basal joints fulvous, the second and third joints equal; thorax about one half broader than long, the sides nearly straight, the anterior angles oblique, forming a tooth before the middle, the surface impunctate; elytra rather closely, finely, and regularly punctate-striate; below piceous; posterior femora bluish; tibiæ and tarsi more or less fulvous.

Caracas.

The leaden-blue colour and the regularly punctate-striate elytra separate *A. regulata* from its allies.

HOMOPHŒTA ÆQUINOCTIALIS, Linn.

San Esteban, Caracas, Corozal, and Colonia Tovar.

HOMOPHŒTA VARIABILIS, Jac.

San Esteban and Colonia Tovar.

ŒDIONYCHIS GRAPHICA, n. sp.

Testaceous; eyes large; thorax impunctate; elytra minutely punctured, each with two spots at the base, a transverse band before and two spots below the middle, black.

Var. Thorax fulvous, with some obscure piceous spots; elytra darker.

Length 2½–3 lines.

Head with a few fine punctures, testaceous or obscure piceous; eyes very large, the intermediate space only half the width of their diameter; clypeus strongly deflexed, nearly black; antennæ entirely flavous, the third and fourth joints equal, the following ones shorter; thorax more than twice as broad as long, the sides with a broad flattened margin, nearly straight, narrowed in front, the anterior angles not much produced, the surface impunctate, fulvous, with an obscure transverse depression near the base; elytra very minutely punctured, testaceous, with two black spots placed across the extreme basal margin of somewhat triangular shape and connected anteriorly, a narrow transverse anteriorly concave band is placed before the middle, not extending to either margin, and two other small black spots, forming a nearly connected similar band, concave at its lower margin, are situated at some distance from the apex; the underside and legs are entirely testaceous.

Caracas and Colonia Tovar.

This species seems to be subject to discoloration, as in some specimens the elytra are of an obscure fuscous colour, the antennæ being similarly darkened; these darker specimens have several blackish spots placed across the disk of the thorax, which in the type are entirely absent.

ŒDIONYCHIS HUMERALIS, Fabr.

San Esteban.

ŒDIONYCHIS DIPUS, Illig.

A variety from Caracas.

ŒDIONYCHIS HONDURENSIS, Jac.

A specimen from San Esteban, which shows no difference from those from British Honduras contained in my collection.

ŒDIONYCHIS PROXIMA, Jac.

Two specimens from San Esteban.

ASPHÆRA ABBREVIATA, Oliv.

San Esteban.

ASPHÆRA ALBIDA, Schauf.

Caracas.

ASPHÆRA LUNATA, Fabr. (*inclusa*, Baly).

San Esteban.

MONOPLATUS (?) OBLITERATUS, n. sp.

Dark or paler fulvous, glabrous and impubescent; palpi filiform; thorax transverse, scarcely visibly grooved, finely punctured; elytra distinctly punctate anteriorly, almost impunctate below the middle, the sides with a short longitudinal costa.

Length 1½–2 lines.

Head rather strongly punctured at the vertex, the frontal tubercles divided by a deep longitudinal groove, the carina sharply raised and long, dividing the clypeus; palpi not incrassate; antennæ not extending to half the length of the elytra, fulvous, the terminal joints darker and gradually thickened, the third joint slightly longer than the following joints; thorax transverse, about one half broader than long, the sides slightly narrowed at the base and very obtusely angulate before the middle, the anterior angles obliquely produced outwards, the surface rather flattened, with a very obsolete transverse depression near the base, very finely and rather remotely punctured; elytra only distinctly punctured at the anterior portion, the rest of the punctures nearly obliterated, the sides with a narrow but well-defined longitudinal ridge from the shoulder to near the middle, but varying in length; tibiæ with two spurs; claws appendiculate.

San Esteban.

This species seems to possess most of the structural characters peculiar to *Monoplatus*, but differs in the very obsolete transverse thoracic groove, this in itself is, however, of no great importance, since the same groove in the genus *Lactica* and other genera is occasionally found to be similarly reduced; in the filiform palpi and the impubescent upper surface it agrees with *Monoplatus*. As regards the double tibial spurs, it should be understood that these are quite distinct in character and seem to me not to have been recognized as such by Clark; in many instances where this author speaks of two teeth or spurs, the inner one is simply the pointed projection of the tibiæ, while the other corresponds with the usual spine found in nearly all Halticidæ; this spine is generally much larger and placed more at the middle of the apex of the tibia. *M. obliteratus* agrees in colour with *M. fulvus*, Baly, but differs quite in the structure and shape of the thorax; the female is larger, of darker colour, and the thorax and elytra are much more strongly punctured.

OMOTOTUS CARINATUS, n. sp.

Dark fuscous, spotted with fulvous and white; head with a short ridge at the vertex; antennæ fulvous, joints 5–6 and 9–11 fuscous; thorax with two anterior tubercles; elytra with strongly raised interstices, the disk spotted with fulvous, and three transverse rows of small white spots.

Length 2 lines.

Head covered with fulvous pubescence, the middle of the vertex with a short but distinct longitudinal ridge; antennæ thickened at the terminal joint, the fifth and sixth and the three apical joints fuscous, the others fulvous; thorax distinctly broader than long,

closely covered with dark and partly fulvous pubescence, obscuring the punctuation, the sides nearly straight, the anterior angles subtuberculiform, each furnished with a single hair, the surface with a transverse distinct depression near the base and two strongly raised tubercles near the anterior margin; scutellum triangular, closely pubescent; elytra finely punctate-striate, transversely depressed below the base, the interstices longitudinally costate, those at the base and the second subsutural costa at the middle more strongly raised than the others, the surface closely covered with dark fuscous or greyish pubescence, the sutural margin and a narrow space at the middle of the disk brighter fulvous or yellowish; each elytron with three transverse rows of irregularly placed small white spots, the first row placed near the middle, the second below the latter, and the third near the apex.

San Esteban, near Puerto Cabello and La Guaira.

O. carinatus, although very closely allied to *O. bituberculatus* *O. fuscatus*, Clark, and *O. albomaculatus*, Jac., seems to differ sufficiently from either species to justify its separation. It differs from the two first named species in the short but distinct longitudinal ridge of the head and in the different colour of the elytra. *O. albomaculatus* is a smaller insect, the head has no ridge, and the elytra are of a more uniform coloration, but have the same small white spots placed similarly; the thorax is, however, less transverse. The colour of the present insect is subject to great variation, some specimens being nearly black, others greyish white or dark fulvous and variously spotted; the more brightly coloured sutural margin and a narrow elongate space on the middle of the disk seem, however, to be constant in all specimens; the anterior legs are generally fulvous, the others darker and spotted.

HYPOLAMPSIS FRAGILIS, Clark.

Caracas.

PHYSIMERUS SIMONI, n. sp.

Dark brown or fuscous, clothed with bright flavous pubescence; antennæ with the 7th and 8th joints fuscous; elytra with the basal portion raised, irregularly variegated with flavous or greyish pubescence and some obscure transverse darker markings.

Length $1\frac{1}{2}$–$1\frac{3}{4}$ line.

Head dark brown, the vertex finely rugose, clothed at the sides with golden-yellow pubescence; eyes large; palpi cylindrical, scarcely thickened; antennæ slender, two thirds the length of the elytra, dark fulvous, the base of each joint often darker, the seventh and eighth entirely dark, the third and the two following joints slender and equal, the following ones gradually shortened; thorax nearly quadrate, narrowed at the base, the sides straight at the latter place, rounded and widened before the middle, the anterior angles slightly tuberculiform, the surface depressed at the posterior portion, giving the middle part a transversely raised appearance when viewed sideways, clothed with short golden-yellow pubescence, principally at the

sides, the middle of the disk darker, sometimes in shape of two longitudinal bands; elytra distinctly broader than the thorax, the basal portion raised, the punctured striæ fine, obscured by short pubescence which forms longitudinal short stripes interrupted by darker spaces below the base, before and below the middle, the interstices slightly convex; underside dark, legs lighter fulvous; posterior claws piceous.

Caracas, Colonia Tovar, and San Esteban.

The present species of *Physimerus* shows very little difference to distinguish it from several other closely allied forms, yet seems to me to be distinct from the hitherto described species, the nearest allied one of which seems to be *P. variegatus*, Harold, from Colombia; in this species, however, the eighth interspace of the elytra is described as more strongly raised and as specially characteristic of that insect. In *P. simoni* there is no trace of any stronger convex interspace, and the punctures are not deeply but finely impressed; the pubescence varies from golden yellow to grey, and is intermixed with single longer stiff hairs, as is frequently the case in other species of the genus; the darker places or spots of the elytra are to be found below the basal raised portion, at the middle and below the latter, where a kind of zigzag obsolete transverse band is formed; all these spots are in some specimens scarcely visible.

EUPHENGES (?) SUBCOSTATUS, n. sp.

Fulvous, glabrous above; thorax very finely punctured; elytra black, finely punctate-striate, the punctuation obsolete below the middle, the sides with an acute short ridge from the shoulder to the middle.

Var. The lateral margin of the elytra more or less narrowly fulvous.

Length 1¼–2 lines.

Head rather deeply punctured near the eyes; palpi scarcely widened; antennæ fulvous, the terminal joints strongly incrassate; the third joint slightly longer than the following ones; thorax about one half broader than long, glabrous, the sides subangulate before the middle, the surface with a few scarcely visible and irregularly placed punctures, fulvous; scutellum fulvous; elytra with a shallow depression below the base, impubescent, the punctures rather deep at the anterior half, gradually finer and nearly disappearing towards the apex; underside and legs pale fulvous; tibiæ armed with a single spur at the apex; claws appendiculate.

San Esteban.

The incrassate antennæ, glabrous upper surface, and the subangulate thorax seem to place this species in *Euphenges*, the filiform palpi preventing the incorporation in *Allochroma*, which otherwise seems closely allied. *Euphenges* seems, moreover, a very doubtful genus and contains two species with filiform and incrassate antennæ respectively. In the present insect a distinct acute ridge runs from the shoulders to the middle of the elytra; these have in some specimens the sutural and lateral margins narrowly fulvous.

SPARNUS MINUTUS, n. sp.

Ovate, convex, glabrous; piceous or black; the base of the antennæ and the anterior legs pale testaceous; head and thorax distinctly punctured; elytra obsoletely punctate-striate, the interstices longitudinally costate.

Length ¾ line.

Head not longer than broad, with some irregularly placed punctures, piceous or sometimes dark fulvous; eyes large; penultimate joint of the palpi but moderately thickened, the apical one acutely pointed; antennæ rather widely separated, extending to the base of the elytra, the second joint strongly thickened and very short, the third scarcely longer and much thinner, the following joints transverse, moniliform, gradually and strongly thickened; the colour variable, the three or four basal and sometimes the apical joint pale testaceous, at other times nearly black; thorax strongly transverse, nearly three times broader than long, the sides nearly straight, the posterior margin rounded, the anterior angles obliquely rounded, the sides distinctly narrower than the middle, the surface with a few fine and irregularly placed punctures; elytra strongly ovate and convex, acutely pointed at the apex, glabrous and shining, nearly black, the punctured striæ rather indistinct except at the base and at the sides, the interstices longitudinally convex, the posterior femora very strongly swollen, their tibiæ slightly curved and longitudinally channelled, armed with a single distinct spine at the apex, the first joint of the posterior tarsi as long as the following three joints together; the swollen claw-joint appendiculate.

From San Esteban and Caracas.

This very small but interesting species probably forms the representative of a new genus closely allied to *Cyrton* or *Sparnus* on account of its glabrous upper surface, the thickened antennæ, and transversely shaped thorax, but seems to differ in the more filiform palpi and the exceptionally distantly placed antennæ. In spite of these differences I prefer to place the insect in *Sparnus* until similarly structured forms are found, the number of genera already existing in the group of *Œdipodes* not making it desirable to increase them without sufficient and substantial structural characters being present. It will not be difficult to recognize *S. minutus* on account of the very strongly ovate, posteriorly pointed shape, and the glabrous upper surface.

DIABROTICA SIMONI, n. sp.

Pale green, the head, scutellum, breast, and the tibiæ and tarsi black; antennæ fulvous, the second and third joints short; elytra subrugose, a sutural narrow short stripe black, the base and two obscure spots at and below the middle flavous.

Fem. Thorax with four piceous elongate spots; humeral calli fulvous.

Var. Elytra without flavous marks, bright green, shining.

Length 2½ lines.

Head with a deep fovea, black, shining; antennæ nearly as long

as the body, entirely dark fulvous, the second and third joints short, equal, the fourth joint longer than the two preceding united; thorax quadrate, slightly narrowed at the base, smooth, shining, green, the disk bifoveolate; scutellum black; elytra closely and finely rugosely punctured, the base, the extreme lateral margin, and the suture narrowly pale flavous, the anterior portion of the suture below the scutellum with a short black stripe; at and below the middle a very obscure flavous transverse spot is seen which in the variety is absent; the abdomen and the femora pale green, the tibiæ, tarsi, and the breast black.

Colonia Tovar.

The two sexes of this species were taken *in copulâ*; the female, which is slightly larger than the male, has four more or less distinct piceous spots placed transversely on the thorax; the shoulders have also a reddish-fulvous spot. The entirely fulvous antennæ and the differently marked elytra separate *D. simoni* from *D. mutabilis*, *D. gemmingeri*, Baly, and other allied species, the smaller size and the want of the black lateral vitta of the elytra, as well as the green abdomen, from *D. virginella*, Baly.

DIABROTICA FULVOFASCIATA, n. sp.

Pale flavous; head, antennæ, and thorax obscure fulvous; elytra pale greenish, with an obscure fulvous longitudinal band, finely and closely punctured.

Male. Antennæ very strongly thickened and widened at the intermediate joints.

Length 2½ lines.

Head pale fulvous, the vertex with a fovea; labrum piceous; antennæ extending to about half the length of the elytra, dark fulvous, the second and third joints very short and equal, the fifth to the ninth joints greatly dilated and thickened, the terminal one narrowly cylindrical with a short appendage; thorax scarcely one half broader than long, narrowed at the base, obscure fulvous, the lateral margins narrowly greenish, the surface impunctate with two obscure longitudinal depressions; scutellum piceous; elytra closely punctured, with an obsolete, longitudinal depression at the sides and faint traces of longitudinal costæ, pale greenish, the middle of the disk occupied by an obscure pale fulvous band from the base to the apex; femora pale greenish, the rest of the underside and legs flavous.

Caracas.

The single male specimen contained in this collection agrees nearly in coloration with *D. porracea*, Har., and several other allied species, but is distinguished by the strongly dilated antennæ and the paler general colour; the former character is also found in *D. mutabilis*, Baly, but this species differs totally in colour.

DIABROTICA ESTEBANENSIS, n. sp.

Black; the basal and the two penultimate joints of the antennæ, as well as the femora below, flavous; head and thorax fulvous, the

latter bifoveolate; elytra metallic green, rugosely punctured, the lateral and apical margin flavous.

Male. Elytra with an elongate tubercle near the apex.

Length 2½ lines.

Male. Head impunctate, entirely fulvous, with a small fovea between the antennæ; the clypeus transversely subquadrate, sparingly pubescent, labrum and palpi flavous; antennæ two thirds the length of the body, black (the two penultimate joints in the female flavous), the basal joint flavous below, the third more than double the length of the second; thorax twice as broad as long, the sides slightly rounded before the middle, the surface impunctate, fulvous, shining, with a deep fovea at each side; scutellum flavous; elytra dark metallic green, the disk transversely wrinkled and rugose, with some narrow longitudinal costæ and a strongly raised longitudinal tubercle near the apex, the lateral margin narrowly, the apical more broadly, flavous; underside and the upper edge of the femora and tibiæ as well as the tarsi entirely black.

San Esteban.

Allied to *D. ambitiosa*, Erichs., *D. puncticollis*, Baly, and several other species, but differing from all in the metallic elytra and the different system of coloration, especially in the black underside.

DIABROTICA VARICORNIS, n. sp.

Fulvous; intermediate joints of the antennæ black; thorax bifoveolate; elytra finely punctured, a ring-shaped mark at the base and another semilunate one near the apex as well as the breast black.

Length 3 lines.

Head impunctate, fulvous; labrum black; antennæ elongate, extending to two thirds of the length of the elytra, fulvous, the fourth and the following five joints fuscous or black, the second joint short, the third slightly longer; thorax impunctate, nearly as long as broad, the surface with two deep foveæ; scutellum fulvous; elytra finely and closely punctured, the base of each with a regular black ring-shaped mark, another semilunate similar mark, open at its posterior portion, placed near the apex.

San Esteban.

Closely allied to *D. inæqualis*, *D. haroldi*, Baly, and *D. biannularis*, but differing from all these species in the fulvous head and legs; from *D. delineata*, Jac., a still more closely allied species, the present insect may be separated by the much longer antennæ, which have their joints (with the exception of the second and third) much more elongate and also differently coloured, and by the elytral broader markings which in *D. delineata* are very thin and fine.

DIABROTICA OBSCURO-MACULATA, n. sp.

Subdepressed, obscure testaceous; antennæ long, the third joint elongate; thorax finely punctured, transversely depressed; elytra closely punctured, the interstices subrugose, the suture anteriorly,

a rounded spot before and another below the middle, obscure piceous.

Var. The anterior elytral spot absent.

Length 2–2½ lines.

Head obscure testaceous, the vertex impunctate, the lower part vertical, the clypeus with a central ridge; labrum black; antennæ more than two thirds the length of the body, testaceous, the basal three joints piceous, the third joint distinctly longer than the second but shorter than the fourth joint; thorax one half broader than long, narrowed towards the base, the disk flat, with a transverse depression near the base, finely punctured and somewhat rugose or finely wrinkled; scutellum piceous; elytra flattened, slightly widened posteriorly, the sides with a longitudinal ridge commencing at the shoulder and extending below the middle, the surface finely and closely punctured and rugose, a small rounded spot near the base and a larger one below the middle as well as the suture anteriorly, piceous; underside and legs testaceous, the tibiæ and tarsi sometimes piceous.

Colonia Tovar.

The long antennæ, finely rugose thorax and elytra, in connexion with their pattern are the principal characteristic distinctions of this species; although there is only one typical and three specimens representing the variety before me, I think that the former probably represents the normally coloured form.

DIABROTICA NIGRODORSATA, n. sp.

Flavous; the head, scutellum, and the sides of the breast black; thorax fulvous, bifoveolate; elytra closely punctured, black, narrowly margined with flavous.

Male. Head deeply excavated below the antennæ.

Length 2–2½ lines.

Head black, impunctate; antennæ two thirds the length of the body, pale flavous, the apical four joints piceous, third joint elongate, as long as the fourth; thorax about one half broader than long, fulvous, stained with piceous, the disk impunctate, with two deep foveæ; scutellum black; elytra closely and strongly punctured, black, the posterior portion of the sutural, the lateral and basal margin narrowly and the apical one more broadly flavous; legs and abdomen flavous.

Colonia Tovar.

The female has a simple, not excavated head; in both sexes the basal flavous margin is irregularly notched at its posterior edge.

DIABROTICA BOLIVIANA, Harold.

San Esteban. Three specimens.

DIABROTICA ROBUSTA, Baly.

A single specimen from San Esteban.

DIABROTICA SERRATICORNIS, Baly.

A single specimen from San Esteban.

DIABROTICA SIMPLICIPENNIS, n. sp.

Ovate, dilated posteriorly, black; thorax transverse, testaceous; elytra very minutely punctured, testaceous.

Length 2 lines.

Head black, impressed with a fovea at the middle of the vertex, the clypeus sparingly clothed with whitish hairs; antennæ two thirds the length of the body, black, the third and fourth joints elongate; thorax twice as broad as long, impunctate, impressed with a rather deep fovea at each side; scutellum black; elytra rather strongly dilated posteriorly, extremely finely punctured; underside and legs black.

Corozal and Colonia Tovar.

Allied to *D. robusta*, Baly, but differing in the black head and underside and in the entirely testaceous elytra; from *D. dilatata*, Jac., the present species differs in the testaceous not black thorax.

DIABROTICA ATOMARIA, n. sp.

Fulvous; the head and the breast black; second and third joints of the antennæ very short; thorax finely punctured, non-foveolate; elytra flavous, closely punctured, a triangular spot on the shoulders, another at the middle, and two spots near the apex, black.

Length 2 lines.

Head impunctate, black, shining, with a fovea between the antennæ; the frontal elevations small but very distinct; clypeus with a central ridge; antennæ about half the length of the body, entirely fulvous, the second and third joints very small and equal, the fourth as long as the three preceding joints together; thorax about one half broader than long, the sides straight at the base, rather suddenly rounded before the middle, the surface without depressions, very finely and irregularly punctured, fulvous, shining; scutellum black; elytra slightly widened posteriorly, very closely and rather strongly punctured, flavous, the suture below the scutellum, a triangular spot on the shoulder, a rounded spot at the middle, and two smaller spots placed transversely near the apex, black; legs fulvous; breast black.

Caracas. Two specimens.

Allied to *D. spilota*, Baly, and several other species, but differing in the position and shape of the elytral spots and their stronger punctuation; of the spots the middle one is placed close to the lateral margins and the two apical spots are nearly joined, forming a semicrescent.

DIABROTICA BIMACULATA, Baly.

San Esteban.

DIABROTICA NIGROSTRIATA, Baly.

San Esteban.

DIABROTICA OBTIVA, Erichs.

Two specimens from Caracas which I refer to this species (having

also been examined by Mr. Baly) are of pale flavous colour and differ in several particulars from Erichson's description: in one specimen the labrum is piceous; the antennæ in both are darker than the colour of the head, their second and third joints are small and equal; the thorax is bifoveolate; the elytra may be described as very finely rugose with more or less distinct longitudinal costæ, especially strongly marked at the sides; the base, a transverse spot at the middle, and another below the latter are pale fulvous, scarcely visible in one of the specimens; the underside and legs are pale flavous, with the outer margin of the tibiæ and the tarsi darker. It is possible that these Venezuelan specimens are distinct from, although closely allied to, Erichson's species, or that they are but local varieties.

DIABROTICA CLYPEATA, Baly.

Colonia Tovar. Two specimens.

DIABROTICA SEPARATA, Baly.

A single specimen from Caracas.

NEOBROTICA INCONSTANS, n. sp.

Obscure fulvous; the head, basal joints of the antennæ, breast, and the tibia and tarsi, black; thorax with a deep transverse groove; elytra finely punctured, each with an elongate subangular black mark at the shoulder and an obscure piceous spot below the middle.

Var. Elytra immaculate.

Length 3 lines.

Head broader than long, impunctate, black (the extreme vertex sometimes testaceous), with a distinct fovea between the eyes; the frontal elevations not defined; antennæ more than half the length of the body, black, the three apical joints (the apex of the terminal joint excepted) pale flavous, the first joint very long and slender, the second very short, the following elongate and nearly equal; thorax twice as broad as long, the sides rounded and widened before the middle; the disk deeply transversely grooved, impunctate, with the exception of some very fine punctures near the anterior angles; scutellum impunctate; elytra finely and closely punctured, the interstices in the male slightly rugose, pale fulvous, the shoulders with a short, narrow, elongate and angulate black mark, the lower angle of which turns inwards, and a round piceous obscure spot below the middle; breast and the tibiæ and tarsi black; claws appendiculate.

Colonia Tovar.

N. inconstans rather closely resembles *N. pallescens*, Jac., from Honduras, but differs in the want of the longitudinal sulcations of the elytra and in the presence of the elytral black markings. The species is probably subject to a good deal of variation, and in the variety the left elytron is pale green and the right one fulvous, neither of them having any markings.

NEOBROTICA DIMIDIATICORNIS, n. sp.

Pale testaceous, the vertex and the intermediate joints of the

antennæ piceous; thorax deeply transversely sulcate; elytra fin[illegible]ly punctured, an angulate mark at the base and another semilun[illegible]te spot near the apex obscure dark fulvous.

Var. The elytral markings replaced by spots or streaks (1, 2, [illegible]).

Length 2–3 lines.

Head impunctate, with a deep fovea between the antennæ, d[illegible]rk fulvous, the vertex more or less piceous; antennæ half the len[illegible]th of the body, the fifth to the eighth joints piceous, the others fulvo[illegible]s; thorax scarcely one half broader than long, the sides straight at [illegible]he base, the surface impunctate, with a deep transverse somewhat sinu[illegible]ate sulcation; elytra finely punctured, scarcely shining, with traces [illegible]of longitudinal grooves, obscure testaceous, the base with an ang[illegible]lar piceous mark, extending to one third the length of the elytr[illegible], a semicrescent similar-coloured mark is placed below the middle; [illegible]gs and underside fulvous.

Caracas and San Esteban.

N. dimidiaticornis resembles greatly several other species of the same genus in colour and the design of the elytra, but is princi[illegible]lly distinguished by the dark intermediate joints of the antennæ and the rather less transversely shaped thorax: in the variety the el[illegible]tra have a small spot placed on the shoulder, two before the mi[illegible]dle placed transversely, and two others below the latter; these spots are sometimes partly connected and indicate the pattern in the speci[illegible]en which I have taken for the type. The appendiculate claws and dee[illegible]ply sulcate thorax will prevent the species for being mistaken for a *Diabrotica*.

NEOBROTICA VARIABILIS, Jac.

Var. Antennæ entirely fulvous.

From Corozal.

The two specimens contained in this collection agree in every w[illegible]ay with the Mexican form described by myself in the 'Biologia Centra[illegible]li-Americana,' except in the colour of the antennæ, which are fulvo[illegible]us as well as the legs. As the species seems, however, to vary in the[illegible]se respects, I think that the Venezuelan insects are but another loc[illegible]al form of the type. *Neobrotica* is at once distinguished from *Diabrotic*[illegible]*a* by the transverse sulcation of the thorax, the longer first joint [illegible]of the posterior tarsi, and the appendiculate claws.

NEOBROTICA (sub DIABROTICA) OBERTHURI, Baly.

Corozal.

CŒLOMERA CAYANENSIS, Fabr.

From San Esteban.

MALACORHINUS UNDECIMPUNCTATUS, n. sp.

Obscure testaceous; the apical joints of the antennæ fuscous; thorax extremely finely punctured; elytra very closely and more distinctly punctured, with eleven black spots (2, 3, 4, 2).

Length 2 lines.

Head impunctate, deeply transversely grooved between the eyes;

the frontal elevations strongly raised, narrowly transverse; clypeus triangular; terminal joint of the palpi acutely pointed; antennæ black, the basal four joints fulvous; thorax transverse, about one half broader than long, strongly narrowed at the base, the angles not produced, the surface with an obsolete oblique depression at each side, very minutely punctured when seen under a strong lens: elytra widened towards the middle, extremely closely punctured, the punctuation consisting of small and still smaller punctures; each elytron with the following black spots—one on each shoulder, three placed transversely across the middle (the centre spot on the sutural margin), four slightly larger spots below the middle forming a semicircle, and one at the extreme apex of each elytron.

Colonia Tovar.

This species forms another addition to those constituting the genus *Malacorhinus* described by myself in the 'Biologia Centrali-Americana,' from all of which it differs in the number and position of the elytral spots: the thorax in all is posteriorly narrowed, the tibiæ have a minute spine (sometimes almost invisible), the first joint of the posterior tarsi is as long as the following joints together, the claws are appendiculate, and the anterior coxal cavities are open. In general appearance the species of this genus resemble those of the genus *Diabrotica*, and seem to inhabit principally Central America.

LOCHMÆA TROPICA, n. sp.

Broadly ovate, black; above dark fuscous; head and thorax finely rugose; elytra with the sutural and lateral margin and two narrow longitudinal costæ testaceous.

Length 2½ lines.

Head finely rugose, the sides of the vertex and the clypeus testaceous; labrum black, shining; antennæ about half the length of the body, black, the third joint the longest; thorax short and transverse, narrowed at the middle, the angles tuberculate, the sides rounded at the middle, the surface transversely depressed, finely rugose, fuscous, the anterior and posterior margins paler; scutellum truncate at its apex, nearly black, finely rugose; elytra broader than the thorax, widened below the middle, rather convex, fuscous; the narrowly raised sutural and lateral margins, and two equally narrow longitudinal costæ at the middle of the disk and not quite extending to the apex, testaceous, the interstices everywhere finely rugose and wrinkled; legs black, unarmed; claws bifid; the anterior coxal cavities open.

Colonia Tovar.

This species has entirely the appearance of an *Adimonia*, but the open coxal cavities would place the insect in Weise's genus *Lochmæa*.

SCHEMATIZA FUNEREA, n. sp.

Elongate, parallel, black; the terminal joints of the antennæ fulvous; the entire upper surface finely rugose, opaque; elytra with faint traces of lighter bands at the sides.

Length 2½–3 lines.

Of rather flattened shape, entirely black; the head with a longitudinal central ridge, finely rugose, the clypeus and the base of the antennæ fulvous or testaceous; antennæ scarcely half the length of the body, black, the three (in one specimen the last joint only) apical joints fulvous, the third the longest, the intermediate joints slightly flattened and widened, closely pubescent: thorax transverse, rather more than twice as broad as long, the sides straight, more or less sinuate or concave at the middle, causing one or two obscure angles, the posterior margins straight; the surface very obsoletely transversely depressed near the base and more broadly at the sides, entirely finely rugose, opaque, the sides furnished with some very minute fulvous hairs; scutellum broad, its apex truncate; elytra very slightly widened posteriorly, the apex rounded, the entire surface finely rugose, black, opaque, with more or less distinct light reflections in the shape of narrow longitudinal bands at the sides; underside and legs black, the coxæ obscure fulvous; tibiæ unarmed, the first joint of the posterior tarsi scarcely longer than the second; claws bifid; anterior coxal cavities open.

San Esteban.

SCHEMATIZA VENEZUELENSIS, n. sp.

Black; the lower part of the face and the apical three joints of the antennæ fulvous; above fuscous or black, finely rugose, the sides of the thorax broadly, and a narrow lateral stripe of the elytra obscure flavous.

Length 3 lines.

Head finely rugose at the vertex, the portion below the eyes and the clypeus fulvous; labrum and jaws black, shining; antennæ rather more than half the length of the body, black, the two or three terminal joints fulvous or testaceous, the third joint very long, longer than the two preceding joints together, the intermediate ones slightly dilated and pubescent; thorax more than twice as broad as long, the sides rounded, the angles with a small tubercle, the surface depressed at the sides, without other grooves, finely rugose, black, the sides broadly pale flavous, the flavous portion narrowed at the base; elytra finely rugose, the apex rounded, the lateral margin from the base to the apex narrowly flavous; underside and legs black, the base of the femora flavous.

From San Esteban and Colonia Tovar.

In this species the third joint of the antennæ is very long and slender, differing in that respect from all the other species of the genus with which I am acquainted, the dilatation of the intermediate joints is also but feebly indicated; but as I cannot find any other different structural characters I have provisionally placed this insect in *Schematiza*.

SCHEMATIZA UNISTRIATA, n. sp.

Obscure fuscous, sericeous; the lower part of the face and thorax pale greyish, the disk of the latter fuscous; elytra fuscous, the

sutural and lateral margin, a spot at the apex, and a narrow lateral longitudinal stripe greyish white.

Length 2 lines.

Head somewhat broader than long, the vertex fuscous, finely rugose and pubescent, the lower part pale greyish; antennæ only extending to the base of the elytra, black, the third joint the longest, the intermediate ones slightly but distinctly widened; thorax transverse, short, the sides strongly rounded at the middle, the surface transversely depressed, the depression more distinct at the sides, the middle of the disk with a short longitudinal groove, the surface very finely rugose and pubescent, of a pale greyish colour with the middle of the disk more or less fuscous; scutellum not longer than broad; elytra narrowly parallel, sculptured and pubescent like the thorax, obscure fuscous, with the sutural and lateral margins very narrowly grey, a similar coloured round spot placed at the apex and an obscure narrow longitudinal stripe (sometimes extending to the base, but always abbreviated posteriorly) at the sides; legs pale testaceous, the femora with a more or less distinct dark spot, and the apex of the tibiæ and tarsi fuscous; underside piceous or nearly black.

La Guaira.

S. unistriata closely resembles *S. apicalis*, Clark, but seems to differ in the paler colour of the thorax and that of the legs and in the similar coloured elytral stripe at the sides; the insect may possibly be a local variety of Clark's species.

LUPERUS MARGINATUS, n. sp.

Testaceous; the upper portion of the head and the antennæ and abdomen black; thorax black, the sides narrowly flavous; elytra finely punctured, black, the lateral margins flavous.

Length 1½ line.

Head broader than long, black, the lower half testaceous; the vertex impunctate, deeply transversely grooved between the antennæ; the frontal elevations transverse; the clypeus thickened; antennæ two thirds the length of the body, slender, black, the lower three joints testaceous below, the third joint twice as long as the second but shorter than the fourth joint; thorax nearly twice as broad as long, narrowed at the base, the sides rounded before the middle, the surface very finely and rather closely punctured, black, very narrowly margined with testaceous at the sides; elytra finely and very closely punctured and wrinkled, black, the lateral and apical margins flavous, more broadly so than that of the thorax; abdomen black; legs and breast flavous; the tibiæ with a minute spine, the first joint of the posterior tarsi rather longer than the three following joints together; claws appendiculate.

Colonia Tovar. Three specimens.

LUPERODES INORNATUS, n. sp.

Obscure testaceous; antennæ fuscous; head with one, thorax with four or five piceous spots; elytra very finely and closely punctured; the extreme sutural and lateral margins piceous.

Length 1¾–2 lines.

Head very finely punctured at the vertex, with a transverse groove between the eyes, the frontal tubercles broadly trigonate; the clypeus triangularly raised; antennæ more than half the length of the body in the male, shorter in the female, fuscous, the base of each joint pale, the two or three basal joints sometimes entirely testaceous, the second and third joints nearly equal; thorax one half broader than long, the lateral and the posterior margin strongly rounded, the surface very minutely punctured with an obsolete transverse depression at each side, the latter obscurely stained with fuscous, the middle with two or three smaller spots placed triangularly; scutellum piceous; elytra scarcely more strongly punctured than the thorax, obscure testaceous, the extreme sutural and lateral margins piceous; below and the legs testaceous, the apex of the posterior tibiæ and the tarsi more or less fuscous; tibiæ with a long spine; the metatarsus of the posterior legs as long as half the tibiæ; anterior coxal cavities open.

Colonia Tovar and Caracas.

GALERUCELLA ORNATA, n. sp.

Pale greyish or fuscous, finely and closely pubescent; thorax with a central and two lateral depressions; elytra with three longitudinal more or less interrupted stripes and two apical spots fuscous.

Var. Much paler, the stripes divided into spots.

Length 1¾–2 lines.

Rather variable in colour, of narrowly elongate shape, the head with a distinct longitudinal central impressed groove, closely pubescent; clypeus strongly transverse and swollen, pale fulvous or testaceous, shining; penultimate joint of the palpi widened, apical one short and conical; antennæ scarcely extending to half the length of the elytra, fuscous or nearly black, in some specimens testaceous with the apex of each joint darker, the second joint short, the third the longest, the following joints gradually diminishing in length, the intermediate ones slightly widened; thorax twice as broad as long, the sides rounded at the middle, then rather suddenly constricted at the apex, the angles in shape of a small tubercle, the anterior margin straight, the posterior one slightly sinuate at the middle; the surface with a deep depression at each side and a more shallow one near the anterior margin, finely and closely covered with yellowish pubescence; scutellum not longer than broad: elytra elongate, with a rather deep longitudinal lateral depression below the middle, closely covered with pale fuscous pubescence, sometimes with a slight fulvous tint; a sublateral and subsutural longitudinal stripe, the former interrupted below the middle, the latter extending nearly to the apex, three elongate spots between these stripes, a spot near the apical margin, and the apex of the suture, paler or darker fuscous; tibiæ unarmed; the first joint of the posterior tarsi nearly as long as the three following joints; claws bifid, the inner division rather short; anterior coxal cavities open.

Caracas, La Guaira, Puerto Cabello.

The stripes of the elytra are often widened at their ends and often only indicated by spots.

GALERUCELLA OBSCUROFASCIATA, n. sp.

Obscure pale greenish, opaque; antennæ fuscous; head and thorax finely granulate; elytra finely pubescent, finely granulate-punctate, with two longitudinal pale narrow bands joined at the apex.

Length 1½–2 lines.

Head broader than long, finely granulate, longitudinally grooved at the middle, greenish; antennæ short and robust, the third joint the longest, the following joints of nearly equal length, the base of each joint pale; thorax twice as broad as long, the sides rounded, the posterior margin sinuate at the middle, the surface with a shallow lateral and central longitudinal depression, coloured and sculptured like the head, clothed with extremely short hairs; scutellum broad, its apex truncate; elytra extremely closely and finely punctured, the green colour interrupted by two narrow longitudinal pale bands, united at a little distance from the apex, the lateral margin also pale, clothed like the rest of the surface with short whitish pubescence; legs pale greenish testaceous.

Hab. Colonia Tovar.

Closely allied to *G. alternata*, Jac. (Biolog. Centr.-Amer.), but narrower and more parallel, the elytra more distinctly granulate and their design different in colour and pattern.

GALERUCELLA FUSCOMACULATA, n. sp.

Piceous, finely pubescent; above obscure testaceous, clothed with yellowish hairs; thorax with depressions at the sides and on the disk, finely punctured; elytra more distinctly punctured, obscurely spotted with fuscous at the base, the middle, and near the apex; legs pale.

Length 1½ line.

Head with a deep longitudinal groove at the vertex, the latter finely pubescent and punctured; the clypeus smooth, transverse, and thickened; antennæ short, distinctly thickened at the terminal joints, fuscous, the third joint the longest, the basal ones obscure fulvous; thorax scarcely twice as broad as long, the sides scarcely rounded, the posterior angles oblique, the disk obscure fuscous or piceous, clothed with short yellow pubescence, finely punctured, broadly impressed at the sides and near the anterior and posterior margin at the middle; scutellum pubescent, its apex truncate: elytra more strongly and very closely punctured, clothed with yellowish pubescence, the basal portion, a small spot near the suture at the middle, and a larger spot near the apex, obscure fuscous; at the middle of the base an elongate raised space is placed, a similar one is seen near the apex, the space in front of it is on the contrary depressed, and several other shallow depressions are situated near the lateral margin.

San Esteban, Caracas.

The elytra, when seen without a lens, have a mottled appearance and the darker portions or spots are of more or less intensity in the different specimens; the underside is always very dark.

MALACOSOMA OLIVACEUM, Fabr.

Corozal.

MALACOSOMA ENCAUSTICUM, Germ.

Colonia Tovar and San Esteban.

2. Description of a new Genus of Fossil Moths belonging to the Geometrid Family *Euschemidæ*.

By ARTHUR G. BUTLER, F.L.S., F.Z.S., Assistant-Keeper, Zoological Department, British Museum (Nat. Hist.).

[Received May 18, 1889.]

(Plate XXXI.)

I have to thank Mr. Robert Etheridge for showing me, and Dr. Henry Woodward for giving me permission to describe, an exceedingly interesting Moth from the Eocene Freshwater Limestone of Gurnet Bay, Isle of Wight; collected by Mr. E. J. A'Court Smith. This is one of the insects found in the Tertiary Nodules on the beach.

In his paper published in 1879 (Quart. Journ. Geol. Soc. vol. xxxv. pp. 342–3), and entitled "On the Occurrence of *Branchipus* (or *Chirocephalus*) in a Fossil State, associated with *Eosphærom*a and with numerous Insect-remains, in the Eocene Freshwater (Bembridge) Limestone of Gurnet Bay, Isle of Wight," Dr. Woodward says:—

"To Mr. E. J. A'Court Smith is due the credit of the discovery of a thin but very richly fossiliferous band in this series of deposits at Thorness and Gurnet Bays, near Cowes, which has largly increased the interest of these beds, especially by a very important addition to the known terrestrial forms of life belonging to the Eocene period.

"The section is as follows:—

"General Section at Thorness and Gurnet Bays.

	Thickness. ft.	in.
Surface soil.		
I. *Grey* Clays with occasional bones of *Emys* or *Trionyx*	10	0
II. Lighter (*Yellow*) Clays with broken shells	2	0
III. *Limnæa* Limestone with *Planorbis* and bones of *Emys*, also hard concretions (*Hard limestone* bed)	3	0
IV. Variegated fossiliferous Clays	8	0
V. Upper Limestone beds with *Limnæa* and small oblong Oyster (*Ostrea* sp.?)	3	0
VI. Band of loose shells with *Ostreæ* and Sharks' teeth	0	6
VII. Blue Clays with *Cyrena*	3	0
VIII. Fossil Plant- and Insect-bed	1	0
Base of cliff.	30	6"

1.

2.

3.

4.

5.

6.

Wolfenden del. et lith.

West, Newman chromo.

Lithopsyche and allied Genera.

Thaites appear to me to be somewhat doubtful, Mr. Scudder's figure, if a facsimile of the original, might with less ingenuity be modified into a form of *Castnia* than into a *Parnassius* or *Thais*.

As it is probable that the colouring of flowers began to develop prior to that of the insects which frequented them, it seems not unlikely that the appreciation of colour shown by Lepidoptera was gained by associating certain tints with their favourite flowers, and once acquired became unconsciously a consideration in the selection of mates: thus we find that in the Arctic regions, where bright flowers do not form a feature of the landscape, the Lepidoptera are dull-coloured, their sense of colour being naturally dormant[1].

LITHOPSYCHE, gen. nov.

Nearest to *Calospila* and *Craspedosis*; resembling *Craspedosis extenuata* of Timor most nearly in the size and form of the primaries, and *Euschema minervaria* of Burma in the form of all the wings, though differing much in colouring; but in the pattern of these wings much more like the less nearly related *Præsos mariana*; venation, so far as it can be followed, closely resembling that of *Calospila leucomela*; the secondaries differing in form, the abdominal margin being longer, as in the males of *Euschema proba* and other allied greyish-blue species; the abdomen extends to about four fifths of the length of the secondaries and terminates in a small tuft-like fringe as in females of *Euschema*; the thorax is represented by a deep impression showing the divisions distinctly.

LITHOPSYCHE ANTIQUA, sp. n. (Plate XXXI. figs. 3, 6.)

Apparently originally black and white, the black having changed to a brown-umber, as in a faded example of *Calospila picaria* in the Museum; primaries with a white spot in the cell as in *Brephos bajularia* (Plate XXXI. fig. 1); a macular white oblique band just beyond the middle, probably represented by the abbreviated band of *Calospila posthumaria*, the less oblique and complete band of *Craspedosis ernestina*, and the broader antemedian band of *Præsos*: three spots placed obliquely about halfway between this band and the apex and two nearer to the outer margin on the median interspaces, as in *Præsos mariana* (Plate XXXI. fig. 4), also a bifid spot still nearer to the outer margin on the interno-median interspace; the secondaries, which are for the greater part concealed by the primaries, show the lower portion of a narrow white postmedian band, situated internally and possibly macular as in *Calospila posthumaria*.

Gurnet Bay, Isle of Wight (*Mr. E. J. A'Court Smith*).

The type specimen is in the Geological collection of the Natural History Museum.

Of the genera immediately allied to *Lithopsyche*, the Museum collection contains examples of the following species:—

[1] I do not mean to say that there are no bright-coloured Arctic flowers; but they are not such as, from their size and abundance, would arrest the attention of any but a trained mind.

CALOSPILA, H.-Sch. (Plate XXXI. fig. 5.)

Black, spotted and banded with white; head sometimes orange.

1. CALOSPILA PSTHUMARIA, H.-Sch. = *Cadyanda lugens*, Walk.
Brazil.

2. CALOSPILA PICARIA, Walk. = *Lagyra picaria*, Walk.
Java.

3. CALOSPILA LEUCOMELA, Walk. = *Celerena? leucomela*, Walk.
Philippines.

SIMENA, Walk.

Blackish or slaty grey, the primaries with or without a white band; head and collar orange.

1. SIMENA LUCTIFERA, Walk.
Central America.

2. SIMENA NIGRICANS, Walk.
Brazil.

CRASPEDOSIS, Butl. (Plate XXXI. fig. 2.)

Black, banded and spotted with white; the abdomen more or less ochreous.

1. CRASPEDOSIS ERNESTINA, Cram. = *Celerena sobria*, Walk.
Amboina and Ceram.

2. CRASPEDOSIS (undetermined species).
Aru.

3. CRASPEDOSIS EXTENUATA, Walk. = *Celerena extenuata*, Walk.
Timor.

MNIOCERA, Butl.

Black, spotted and sometimes banded with white; the abdomen banded with ochreous.

1. MNIOCERA CINCTA, Walk. = *Celerena cincta*, Walk.
Timor.

2. MNIOCERA CINERESCENS, Butl.
New Ireland.

Of these genera the species from the Malayan and Moluccan islands are much nearer to *Lithopsyche* than those of the New World, the latter being probably of more recent origin; of the allied genera with partly ochreous or orange secondaries, viz. *Bracca* and *Præsos* from Australia, the latter still retains almost the same pattern on its primaries. If, therefore, any form more closely related to

Lithopsyche than *Calospila leucomela* still exists, it is probably to be found in one of the islands between Java and Australia.

I have already stated my belief that the Nymphalidæ, and in fact most Lepidoptera, were originally black and brown, but the Pierinæ and, I might add, probably the Geometrites were white, or white with black bodies. It is perhaps worth while to show some reason for this belief beyond those already given.

Assuming that the Nymphalidæ were for the most part originally black, or black and brown forms, there should be a far greater proportion of violet, blue, crimson, and reddish orange in this family than in a group such as the Pierinæ, presumably developed from forms which were originally either wholly or for the greater part white: the aberrant types also would, I think, be more likely to revert to melanism in the Nymphalidæ and other dark groups, and albinism in the Pieridæ [1].

In the Euplœinæ, one of the larger subfamilies of the Nymphalidæ, a considerable proportion of the species are black or dark brown, many of them suffused with violet or blue, and in the more highly coloured forms with patches of blue in the centre of the wings. On the other hand, there are not a few genera in which white, pale yellow, or green are the predominant colours, and these may have been modified from forms originally either white or black, most of these genera showing extreme types of colouring in some of their species.

In the Pierinæ there are hardly any genera in which white species do not still exist and forms with white females are abundant; it is also a significant fact that *Ganoris rapæ* (probably introduced into the United States about 1856–7) suddenly developed the yellow form *G. novangliæ*. Indeed the change from white to yellow seems so easy that one can almost be certain that the latter has been derived from the former and is the result of a more vigorous constitution [2].

In the Geometrites also it is not unusual to find white and bright yellow species in one genus, and occasionally individuals of the same species differ in a similar way—*Syllexis lucida* from Chili is either shining lemon-yellow or silvery white.

Now I think, if it be admitted that the earliest types of Geometrites were black with white markings or *vice versâ* and that the white was gradually modified into yellow and the black into blue, one can conclude that *Milionia*, the most highly ornate genus of the Geometrites, was one of the last developed, or at any rate has passed through more stages of development than any of its allies. Assuming that it has been produced from such a form as *Lithopsyche*, the white bands have first become clear yellow as in *Bocirana*, then saffron as in *Bordeta quadriplagiata*, orange as in *Milionia zonea*, partly crimson as in *M. snellenii*, or wholly crimson as in *M. guenthi*;

[1] We obtained a singular albino of *Hebomoia glaucippe* from Dr. Lidderdale's Darjiling series; in this specimen all the black markings are replaced by white.

[2] Some years since I found a wild white primrose, which I planted in my garden and hoped to multiply, but it yielded no seed and division of the root destroyed it entirely.

the black of the wings has become first blue-black, then brightly shot with bluish purple, and finally streaked at the base with metallic blue and green. Then, again, if the white of the secondaries was first modified into yellow and orange as in *Bracca* and *Præsos* (in which the primaries are still black and white), one can see how the bands on the primaries of *Milionia drucei* and *M. snelleni*, if derived from such a source, may have remained orange after those of the secondaries had become vivid crimson.

It has been said that colour is of no value as a guide in classification, but I am not at all sure that, if the natural order of its development were strictly looked to, it would not be of assistance in guiding one to a judicious arrangement of allied genera.

EXPLANATION OF PLATE XXXI.

Fig. 1. *Bracca bajularia*, p. 294.
2. *Craspedosis extenuata*, p. 295.
3. *Lithopsyche antiqua*, from the typical specimen, p. 294.
4. Fore wing of *Præsos mariana*, p. 294.
5. *Calospila leucomela*, p. 295.
6. Restoration of *Lithopsyche*, p. 294.

3. Descriptions of new Genera and Species of Odonata in the Collection of the British Museum, chiefly from Africa. By W. F. Kirby, F.E.S., Assistant in the Zoological Department, British Museum, Natural History, S. Kensington.

[Received April 26, 1889.]

On looking through the collection of Odonata in the British Museum lately, I found examples of some very interesting species which appear to be undescribed, and which form the subject of the present paper. Among these, the most important is *Tatocnemis malgassica*, a species representing in Madagascar two remarkable Eastern genera, *Priocnocnemis* and *Idiocnemis*, hitherto only known from the Philippines and New Guinea respectively.

The following is a list of the genera and species which I propose to describe:—

ODONATA.

LIBELLULIDÆ.

LIBELLULINÆ.

Orthetrum camarense, n. s. ..... Cameroons.
Æthriamanta rezia, n. s. ..... Madagascar.

ÆSHNIDÆ.

GOMPHINÆ.

Pseudogomphus (n. g.) *insignis*, n. s. ..... Cameroons.

ÆSHNINÆ.

Anax striatus, n. s. ..... Chili.

AGRIONIDÆ.

CALOPTERYGINÆ.

Sapho pulchella, n. s. ..... Cameroons.

AGRIONINÆ.

Tatorneuis (g. n.) *malgassica*, n. s..... Madagascar.
Protostricta gracilis, n. s. ..... Menado, Celeb——es.
Lestes wallacei, n. s. .... Sarawak, Born——eo.

ORTHETRUM CAMARENSE.

Exp. al. 22 millim.; long. corp. 49 millim.

Male. Black, vertex metallic blue; abdomen inflated at base, ——with the third segment pulverulent blue. Wings brownish hyaline: ——fore wings with 19 antenodal and 14 postnodal cross-nervures; t——e 3 first postnodals not continuous; triangle traversed by one or two cross-nervures; one supratriangular nervure; 3 cells in the ——sub-triangular space; three rows of post-triangular cells, increas——ing, commencing on one side with four. Hind wings with 14 anten——odal and 13–14 postnodal cross-nervures, the base tinged with sm——oky yellow, the membranule dark smoky brown, and a basal stripe of ——the same colour in the second costal space as far as the third cr——oss-nervure, and another in the lower basal cell, shorter, and not ex-tending to the base of the triangle, which is traversed, though t——here are no supra-triangular nervures on the hind wings. Tips o——all the wings slightly clouded with brown beyond the pterostig——ma; appendages of 2nd segment large; anal appendages black, abou——t as long as the last two segments (the lower one as long as the otl——ers) and of the ordinary form. Pterostigma dark brown, covering ——3 or 4 cells.

Hab. Cameroons.

Allied to *O. albistyla*, Selys, from which the darker wings and black appendages will abundantly distinguish it.

ÆTHRIAMANTA REZIA.

Long. corp. 27 millim.; exp. al. 50 millim.; long. pte——r. 2 millim.

Male. Size, shape, and neuration of the Indian *Æ. brevipennis*, Ramb., except that the sectors of the arculus rise from a short but distinct stalk. The left fore wing has two cross-nervures instead of one in the lower basal cell, and the triangle of the right fore wing is traversed, and that of the left free.

Body reddish above (probably bright red when living), pectus and pleura inclining to green, legs black, femora greenish beneath. Abdomen with the second and third segments carinated; the dorsal carina black on the fourth and following segments. Anal appendages as long as the 8th segment; lower appendage very broad, spatulate.

Wings hyaline; pterostigma olive, between black nervures: hind wings strongly and fore wings slightly tinged with yellow at the base; a dark streak in the lower basal cell, commencing beyond the base, and filling up about two fifths of the length of the cell.

Hab. Madagascar.

Genus Pseudogomphus.

Male. Eyes contiguous, frontal tubercle slightly bifid; labium ft. Wings long and rather pointed, triangles rather small, free, ose on the hind wings rather longer than those on the fore wings: re wings with 6–8 cross-nervures in the lower basal cell, and four pratriangular nervures: hind wings with 2 or 3 supratriangular rvures, and 5 in the lower basal cell; membranule rather large: ter margin concave between this and the anal angle. Abdomen th the appendages of the second segment large, upper anal pendages about as long as the lower, which is broad and trun-ed; at their base rises a strong vertical conical spine, pointed at apex.

robably allied to *Cordulegaster*, but very distinct from any ribed genus.

Pseudogomphus insignis.

ol. al. 94 millim.; long. corp. 83 millim.

le. Dark brown, tinged with reddish, especially on the face eura; vertex punctured, shining with green and violet; thorax above and on the sides in certain lights; third segment of domen yellow.

gs yellowish hyaline, darkest at the edges; pterostigma black, g rather less than 3 cells; fore wings with 16–18 antenodal –12 postnodal nervures; triangles and subtriangular space

. Cameroons.

Lax striatus.

. al. 105 millim.; lat. al. ant. 12 millim.; lat. al. post. 17 .; long. pter. 3 millim.; long. corp. 75 millim.

taceous yellow; head with the front raised, rugosely-punc-and marked with a blackish spot on the summit: the region of ocelli, the lower edge of the nasus, and all the mouth-parts sh brown, more or less varied with yellow at the sutures. On horax the septa are very strongly ridged, and are marked with in front and within; there are also four black spots on the essions of the pleura; legs reddish. Abdomen with the first and nd segments much swollen, the hinder half of the second seg-t with black markings diverging on each side of the carina; the wing segments with two blackish spots at the base, two smaller beyond the middle, and an irregular blackish stripe crossing carina before the extremity; the incisions are also marked with k in the middle; on the 7th and 8th segments these marks ome more suffused and irregular, and are not continued further. Wings very broad, clear hyaline, the space between the costal and costal nervures filled up with smoky yellow, very dark at the e, and ceasing, like the costal nervure, at the nodus; the lower al cell is also stained with yellow as far as the lower triangle; rostigma brown, very short. Fore wings with 20–21 antenodal

and 15 postnodal nervures; triangle about three times as long as broad, consisting of 4 cells, followed by 5 or 6 cells, and then by 2 increasing; 2 supratriangular nervures; 3 cross-nervures in the subtriangular cell; lower triangle free (which corresponds to the subtriangular space in *Libellulinæ*). Hind wings with 15 antenodal and postnodal nervures; triangle about twice as long as broad, consisting of 4 cells, followed by 4 or 5 cells, and then by 3 increasing; 2 supratriangular nervures; 4 cross-nervures in the lower basal cell; lower triangle transverse.

Chili (*Edmonds*).

The specimen appears to be a male, but the abdominal appendages are too much damaged for description. It is the first *Anax* described from Chili, and is remarkable for the very short pterostigma, which separates it from all the other species of the genus with which I am acquainted.

SAPHO PULCHELLA.

Exp. al. 64–70 millim.

Male. Bronzy black above, head spotted with tawny, the ocelli being placed in the middle of four tawny spots; thorax with the lateral lobes almost entirely surrounded with tawny, the pleura striped with the same colour, and the under surface somewhat pruinose; legs black, femora testaceous, marked with a black line. Abdomen with a tawny spot on the sides, at the base of the first five segments, and a tawny lateral stripe on the sides of the first segment, continued more narrowly on the second and third, where it i coppery. Wings bright orange-tawny or coppery, iridescent, paler a the base; stigma brown, enclosed by black lines, about four time as long as broad, the lower side projecting basally in a point neuration very close; antenodal nervures upwards of 40, and post nodal nervures numbering 50 or 60.

Female. Body similarly coloured, but wings brownish hyaline with a fiery copper iridescence in certain lights, and a narrow milk white band on both wings, not quite extending to the costa or inne margin, and curved on the hind wings, placed considerably beyon the nodus. On the abdomen, the tawny spots at the base of th segments and the tawny lateral line are continued on all the fi segments which remain.

Hab. Cameroons.

Size and shape of *S. longistigma*, Selys, a specimen of which w received in the same collection, but with the abdomen rather short and stouter.

Genus TATOCNEMIS.

Male. Wings long and narrow, petiolated to the level of th arculus, with three concavities on the hind margin, between th subcostal radius and the lower sector of the arculus; fore wing with 24–28 and hind wings with 20–21 postnodal nervures; pterostigma broad, lozenge-shaped, covering 1½ or 2 cells. The median sector rises at or a little beyond the nodus, the subnodal

sector from the second postnodal cross-nervure on the fore wings (exceptionally from the first or third), and from the first on the hind wings; the nodal sector rises at the 9th to the 13th cross-nervure (usually from the 10th) on the fore wings, and between the 6th and 8th on the hind wings; and the ultranodal sector rises from two to four (usually two) cross-nervures further. The first postcostal nervule is placed very little beyond the first antenodal cross-nervure. The arculus is angulated, and placed distinctly beyond the level of the second antenodal cross-nervure. The trapezium is about twice as long as broad; its basal side is shorter than its outer, which is oblique, and its upper side is shorter than

Tatocnemis malgassica.

a. Insect, natural size.
b. Extremity of abdomen, showing appendages, magnified 7½ times.

its lower; there are from two to four cells (usually two) between the trapezium and the first transverse cross-nervure from above; the lower sector of the trapezium rises on a level with the middle of the trapezium, and runs to the hind margin beyond the level of the origin of the ultranodal sector. Nodus placed at about one fourth of the length of the wing.

Abdomen long and slender, first joint very short, second about 2½ times as long as broad, 3rd 4 times longer than the second, the rest gradually shortening to the 7th; 8th about half as long as the 7th; 9th and 10th each about half as long as the preceding; upper anal appendages as long as the 9th segment, arched, with a large semicircular protuberance beneath; lower appendages very short.

Legs slender, not dilated, with long slender spines.

A very remarkable genus, most nearly allied to *Priocnocnemis*, Selys (=*Hypocnemis*, Selys, olim), from the Philippines, and *Idiocnemis*, Selys, from New Guinea, the only genera of Odonata known with emarginate wings. It differs abundantly from both

in the extremely petiolated wings, the large pterostigm
different points of origin of the sectors.

TATOCNEMIS MALGASSICA. (Woodcut, p. 301.)

Exp. al. 72 millim.; long. corp. 50 millim.

Male. Head black above, pale reddish beneath; ocelli, t
the labrum, two spots within the eye, and the occiput
reddish; thorax black above and on the sides, yellowish
middle of prothorax dull reddish above; mesothorax
oblique tawny shoulder-stripes, connected by an oblique
base of the wings: legs red, yellow at base of femora, knee
abdomen bright red, the first joint with some blackish m
the sides above; wings yellowish hyaline, with black nervu
stigma tawny.

Hab. Betsileo, Madagascar (*Rev. Deans Cowan*).

PROTOSTICTA GRACILIS.

Exp. al. 62 millim.; long. corp. 51 millim.

Male. Head black; labrum above yellow; thorax bron
the sides, green in the middle above, in some lights, an obl
stripe below the fore wings; the under surface, especial
and the legs yellow, the latter with long slender hairs
long and slender, thickened towards the extremity, bro
the last three segments pale (probably blue or green in li
surface with a long yellow spot at the base of the first 7 s

Wings hyaline, with black nervures; pterostigma larg
long as broad, covering two cells, oblong, but the inner
angle truncated, making the upper side shorter than th
double row of cells beyond the pterostigma. Fore wing
22, and hind wings with 18 postnodal cells. Median an
sectors rising just before and after the nodal cross-nervu
tively; the nodal sector rising 5 or 6 cells beyond, and
nodal one or two cells further. Trapezium regular, abou
long as broad, its upper sector extending to the level of th
the nodal sector; its lower sector absent. Two basal
nervures, the first halfway between the base and the firs
cross-nervure, the second just before the level of the se
nodal cross-nervure. Two cells between the trapezium a
descending nervure.

Upper anal appendages as long as the 9th segment, in
lower ones shorter, but their exact structure not visible.

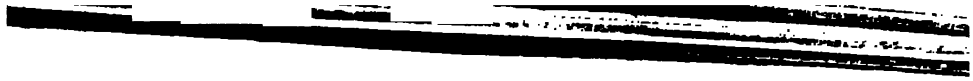
Hab. Menado, Celebes (*Wallace*).

The generic characters differ a little from those
Protosticta simplicinervis, Selys (also from Celebes), wh
before me, and I have therefore included them in the des

LESTES WALLACEI.

Exp. al. 55 millim.; long. pter. 2½ millim.; long
millim.

Female. Head buff, a bronzed spot, shading into gre



ocelli, a black spot on each side of the frontal ocellus, a black e before it, and a short stripe bordering the inner orbits; the r mouth-parts are also almost entirely black. Thorax buff, oversely striated, with a broad green stripe on each side of the al carina, and a narrower bronzed shoulder-stripe, showing green rtain lights, beneath. Legs buff, clothed with long fine black tles; femora with a black line beneath; tarsi black. Abdomen , bronzed above, except at the sutures. Wings hyaline, slightly ded at the tips; fore wings with 14 and hind wings with 15 nodal cross-nervures; pterostigma large, covering 3 or 3½ cells. *Hab.* Sarawak, Borneo (*Wallace*).

ppears to be allied to *L. viridula*, Ramb., but much larger.

On the Taxonomic Value of the Intestinal Convolutions in Birds. By Hans Gadow, Ph.D., M.A., Strickland Curator and Lecturer on the Advanced Morphology of Vertebrata in the University of Cambridge.

[Received May 1, 1889.]

(Plate XXXII.)

n 1879 I published, in the 'Jenaische Zeitschrift' [1], two lengthy cles on the digestive system of birds, and I laid particular stress n the convolutions of the small intestine, *i. e.* upon the mode in ch this part of the alimentary canal is stowed away in the minal cavity.

ccounts of these convolutions are exceedingly meagre, and is all the more surprising as Cuvier long ago drew attention to remarkable diversity which prevails in the arrangement of the stinal folds. However, there are only a few dozen birds described in his 'Leçons d'Anatomie Comparée,' no generalizing conions are drawn, and with few exceptions (MacGillivray) this of descriptive ornithotomy has slept ever since.

ly former researches were based upon the examination of about different birds, an ample material, but not large enough to warrant he taxonomic conclusions which I then drew, especially as these e marred by the fetters of certain antiquated traditions, now nately superseded.

n preparing the account of the alimentary canal of birds for n's 'Klassen und Ordnungen des Thierreichs,' I have recently occasion once more to take up this question on a much broader s and in a more elaborate way. I therefore take the opportunity to lay before the Society a condensed account of the taxonomic e of the intestinal convolutions in birds.

[1] "Versuch einer vergleichenden Anatomie des Verdauungssystemes der el," Jenaische Zeitschrift fur Naturwissenschaft, xiii. pp. 92-117, 339-403, v.-xi. & xvi.

For much of the material, which comprises now far more t
300 species, belonging to nearly every principal family, includ
many of the rarest forms (such as *Crypturi*, *Turnices*, *Pedionom*
Ocydromus, *Opisthocomus*, *Rhinochetus*, *Podica*, *Trogon*, *Col*
Podargus, *Manucodia*, *Pitta*, &c.), I am indebted to this Soci
to its present Prosector, to Professor Newton, to the Muse
of Cambridge, to that of the Royal College of Surgeons,
Natural History Museum at South Kensington, and last, not le
to my friend Professor Fuerbringer. Gifts from private ha
from ornithological friends, are remarkable for their scarcity; th
from Mr. Harvie Brown and from Sir Walter Buller were theref
all the more welcome.

The intestinal canal, from the pylorus to the cloaca, is attac
to the mesentery. This connects the folds or loops of the intes
with each other in various ways. In a typical loop we distingu
between a descending branch and an ascending branch; both mee
the distal end or apex of the loop, and this of course forms its tu
ing point. The starting point is the pylorus, the goal the clo
Each loop is either closed or open. It is closed when both the
scending and the ascending branches are throughout the length
the loop closely bound together by an extension of the mesent
and its vessels. Of these vessels, as a rule, each principal l
receives one bigger branch from the middle mesenteric artery.
loop is open when its two branches are not closely connected
mesentery and vessels; the mesentery is wider, and the two branc
of the loop can receive another loop or intestinal fold between th
the latter then resting upon the mesentery of the former open loo

The duodenum is always a typically closed loop. Its first
descending branch lies to the right of the second or ascend
branch; both invariably enclose the pancreas.

A loop which runs in the same way as the duodenum may
termed *right-handed*; those loops which run in the opposite way
then *left-handed*, *i. e.* their ascending branch lies to the right,
ventral, of the ascending, or dorsal, branch. Again, if the intes
forms a number of (mostly closed) loops, which run parallel w
each other in the long axis of the body, we term this arrangem
orthocœlous, or straight-gutted.

If, on the other hand, some of the loops form a spiral, we
tinguish this formation as *cyclocœlous*.

Of the orthocœlous type the following modifications dese
especial remark with reference to the second and third loops;
first, or duodenal, loop is invariably right-handed, and theref
needs no further comment.

I. *Isocœlous*.—The 2nd and 3rd, and, if present, also the 4th l
are all closed and left-handed. The 2nd is most dorsally situat
the 3rd to the right of it, the 4th to the right of the latter, betw
it and the duodenum. The ascending branch of one loop runs
by side with the descending branch of the next following one.

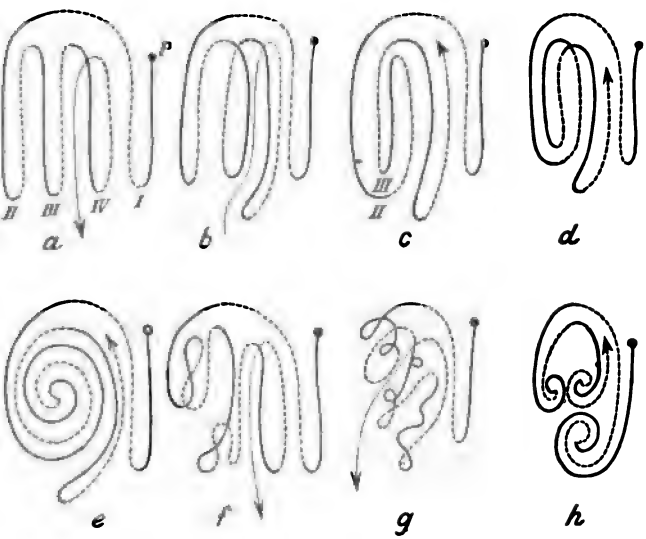
II. *Anticœlous*.—The 2nd and 3rd loops are closed and shar
attenuating; the 2nd is left-, the 3rd is right-handed; the 2nd

sally, consequently its ascending branch runs side by side with
t of the 3rd.

II. *Plagiocœlous.*—The 2nd loop always, often more loops,
doubled up or turned over with the apices like a horseshoe,
ing the loop, which is generally open, an irregular or convoluted
earance.

V. *Pericœlous.*—The 2nd loop is left-handed, open, and encloses
3rd, which is generally straight and closed. This formation is
special interest, because it leads quite gradually to the

. *Cyclocœlous formation* by the conversion of the second and third
s into one left-handed spiral. Such a conversion of the second



Diagrammatic representation of the principal relative positions of the intestinal loops when seen from the right side.

socœlous. *b.* Anticœlous. *c.* Anti-Pericœlous. *d.* Iso-Pericœlous.
e. Cyclocœlous. *f, g.* Plagiocœlous. *h.* Telogyrous.
he descending branches of the loops are marked by black lines, the ascend-
or returning branches are dotted.
he first and third loops in fig. *b* are "right-handed," the second is "left-
ded;" in fig. *c* the second is "left-," the third "right-handed," &c.

third loops into a spiral has taken place in the Limicolæ, Laridæ,
Columbæ. Each of these families possesses some genera in
ich the spiral is still represented by long, oval, concentric turns,
even some genera which still exhibit the pericœlous type with the
loops in question still separate, distinct, and more or less straight.
Not every spiral, however, is formed by the concentration of two

loops. In many instances a spiral is produced by one lo
curled upon itself, its apex then forming the centre of th
On to the apex is attached the diverticulum cæcum vite
shows that this spiral is produced by the primitive fold of
bryonic mid-gut.

Such is the case in all the Passeres, and since there are o
folds formed by the whole gut, the spiral represents the n
second fold; hence this arrangement may be distinguished
gyrous. The number of turns in such a spiral depends
upon the length of the intestine; whilst in the short-gutte
the spiral is just indicated, there are in the Sparrow (
intestinal length of 21 centim.) 1½ direct and 1 retrograde t
in *Pinicola enucleator* (which possesses an intestine of 99 c
length) there are many direct turns.

It is clear that with an original number of only four lo
conversion of the two middle ones into one spiral will ca
birds as certain Limicolæ, Laridæ, and Columbæ likewise t
the mesogyrous feature; but the position of the diverticl
original third loop, and the relations of these birds, lik
Charadrius and *Sterna*, show that this mesogyrous forma
been brought about in a way different from that of the Pass

Lastly, the distal portion of any loop originally strai
become coiled up into a spiral, whilst the rest of the loop
straight. This feature may be termed *telogyrous*. With
denum this is very rare, it then invariably forms a right
spiral, *e. g.*, in *Buceros*, *Ciconia*, *Milvus*; the duodenum
irregularly twisted in certain Pelargi and Accipitres. Th
the second, third, and fourth loops are never coiled up into
spiral, but rather form irregularly coiled up masses, i
Pelargi, Accipitres, and in the Psittaci.

We see, then, that the cyclocœlous (meso- or telogyrous)
by itself cannot be taken as a character which indicates th
of the larger groups or orders of birds, unless we take the
development of these concentric convolutions into consi
In fact the cyclocœlous formation is the highest mode of
away in the smallest compass that portion of the gut whic
be increased in length, the relative length of the mid-gu
dependent upon the nature and composition of the food. I
orthocœlous birds the increased length of the gut causes
mation of secondary folds anywhere between the previously
loops, whereby frequently a very irregular arrangement o
convolutions is caused. A similar process has produced th
cœlous feature (fig. *f*, p. 305), which was probably derived
orthocœlous basis.

The highest and perhaps newest mode of stowing
increased amount of intestinal length is that in which on
folds already existing is lengthened and, owing to its i
growth, turns into a spiral; in this way the other loops will
the least possible disturbance.

I do not think it necessary to give here a long and

ration and description of the intestinal convolutions as they in the numerous orders and families of birds, because this will ne elsewhere.

e Table (pp. 308, 309) contains, in a condensed form, an account principal modifications of the intestinal folds, and the diagram XXXII.) shows the affinities, or, to speak more cautiously, the *rgent similarities*, of all the principal families, as they are sted merely by a study of their intestinal arrangements. *The will be discussed only from this point of view in order to test, to draw attention to, the taxonomic value of those characters are exhibited by the modes in which the mid-gut is stowed away e abdominal cavity.*

ny of these similarities are perhaps merely coincidences, and is case can have no taxonomic significance; but if these simi- s coincide with those of several other organic characters, they ntitled to a higher rank as indicating not convergence but ion descent of those birds in which they persistently occur.

ere seems to be a sort of belief prevailing that the intestinal lutions are very variable and unreliable in the same species, hey are a matter of accident; but, on the contrary, I have found constant to an astonishing extent, not only in the same species many large families. Of course secondary shortening and ing of the gut (owing to the assumption of frugivorous habits) reduce the number of loops, and may render the original gement quite untraceable, as in, e. g., *Carpophaga*, *Rhamphastus*, *codia*. When a bird has acquired strictly piscivorous habits, it is considerably lengthened and narrowed, and may, just as in *on* and in *Haliaetus*, render the old formation quite unrecog- e. These are, however, exceptions, which are not numerous; ule the lengthening of the pre-existing loops and the additional alation of new ones does not disturb the typical formation, but r throws interesting lights upon the lines of new departure along certain birds have become developed, *e. g.*, the Alcedinidæ a Coraciine stock, now modified through the acquisition of vorous and piscivorous habits.

the following Table the order adopted is one of mere con- nce, without necessarily indicating near relationship. The d column contains the number of principal loops; this can be ascertained by spreading the intestine out on the table with- earing the mesenteric connections. The next three columns to the 2nd, 3rd, and 4th principal loops: *r* means that the loop uestion is a right-handed one, like the duodenum; *l* that it is grade, or left-handed; *o* signifies that the loop is open; *cl* that closed. The last column indicates in a few words the type of ation.

he diagram (Plate XXXII.) requires some explanation. All birds of which the names are written inside the inner of the concentric circles are on the whole orthocœlous, whilst those d between the two concentric circles are cyclocœlous; of the , the underlined families are telegyrous, the others mesogyrous.

The four smaller excentric circles contain the plagio-, peri-, ant—, and isocœlous modifications of the orthocœlous type.

Consequently the Passeres are mesogyrous, with besides antic— lous formation. All the Columbæ are pericœlous; some, or rath— the majority, with a mesogyrous spiral. The names are placed —n such a way as to show that similarity or relationship which is ind— cated by the intestinal arrangement.

	Number of principal loops.	Loops.			
		II.	III.	IV.	
Dromæus	...	*r, o*	*l, o*	...	Several transverse open loops besides the duodenum.
Casuarius	3	*r, o*	*l, o*	...	Besides the duodenum with two short loops.
Rhea	2(3)	*r, o*	*l, o*	...	Besides the duodenum with one large, open loop, which begins to form two secondary ones.
Struthio	3	*r*	*l*	...	Besides the duodenum the mid-gut and the colon form each one enormous convolution of many folds.
Apteryx	4	*r, o*	*l, o*	...	Second and third loop with terminal twist; both with the last placed transversely.
Crypturi	3	*r, cl*	*l, o*	...	Orthocœlous.
Rasores	4	*r, cl*	*l, o*	*l, o*	Plagiocœlous.
Turnices	4	*l, cl*	*r, o*	*l, o*	Plagiocœlous.
Pteroeles	4	*l, cl*	*l, cl*	*l, cl*	Isocœlous.
Rallidæ	5	*l, o*	*l, cl*	*r, cl, o*	Pericœlous.
Limicolæ	4	*l, o*	*r, cl*	*r, cl, o*	Pericœlous.
	3	Spiral		*cl*	Mesogyrous, cyclocœlous.
Laridæ	4	*l, o*	*r, cl*	*o*	Pericœlous.
	3	Spiral		*o*	Mesogyrous.
Columbæ	4	*l, o*	*r, cl*	*cl*	Pericœlous.
	3	Spiral		*cl*	Mesogyrous.
Alcidæ	6	*l, o*	*r, cl*	*l, cl*	Amphicœlous; the last 3 loops closed, straight, and left-handed.
Sphenisciдæ	12+	*l, o*	*r, o*	*l, cl*	Many orthocœlous, closed loops; some of them with numerous irregular convolutions.
Colymbus	5	*l, c*	*r, cl*	*l, cl*	All orthocœlous, closed and alternating.
Pygopodes					
Podiceps	4	*l, cl*	*r, cl*	*l,cl* or *o*	
Herodii	6	*l, cl*	*r, cl*	*l, cl*	Orthocœlous, alternating, closed lips; duodenum often turned far round to the left.
Steganopodes	6+	*l, cl*	*r, cl*	*l, cl*	Orthocœlous, closed, alternating.

TABLE (*continued*).

	Number of principal loops.	Loops. II.	Loops. III.	Loops. IV.	
ares	4 to 7	*l*, *cl*	*r*, *cl*	*l*, *cl*	Orthocœlous, closed, alternating. (*Puffinus*, *Diomedea*, *Oscifraga*.)
	3	Spiral		*l*, *cl*	Mesogyrous; last loop telogyrous. (*Procellaria*.)
	4	*r* or *l*	*l*	*l*, *cl*	1st, 2nd, 3rd often telogyrous; closed.
.....	3	Spiral		*r*, *cl*	*Ibis rubra*; or one of the middle loops forms a long left-handed spiral. (*Platalea*, *Phœnicopterus*.)
	6	*l*, *cl*	*cl*	*cl*	Orthocœlous, the first three often telogyrous; often with numerous secondary folds.
tres	5	Spiral		*cl*	Mesogyrous. All the Accipitres and *Cathartes* with irregular kinks above the rectum.
tes	6	*l*, *o*	...	...	2nd pericœlous. (Rest uncertain.)
irostres	5 or 6	*l*, *o*	*r*, *o*	*l*, *cl*	2nd plagiocœlous or pericœlous; the others orthocœlous, the last three closed.
ccones.....	4	*r*, *cl*	*l*, *cl*	*l*, *cl*	Orthocœlous; 3rd with slight plagiocœlous indication.
dæ	4	*r*, *cl*	*l*, *cl*	*l*, *cl*	Orthocœlous, apices of middle loops often turned up, or the second plagiocœlous.
hagidæ	3	...	*l*, *cl*	*l*, *o*	Isocœlous.
e	3	*l*, *cl*	*l*, ½*o*	...	Isocœlous.
nidæ.....	3	*l*, *cl*	*l*, *cl*	...	Isocœlous.
tidæ	4	*l*, *cl*	*r*, *cl*	*l*, *o*	Anti-orthocœlous.
dæ	3	...	*r*, *cl*	*l*, *o*	Orthocœlous; 2nd loop of Bucerotidæ not developed.
.....	4	*l*, *cl*	*r*, *cl*	*l*, *o*	Anti-orthocœlous.
phastidæ	3	...	*r*, *cl*	*l*, *o*	Orthocœlous; 2nd loop of Picidæ not developed.
idæ.....	4	*l*, *cl*	*l*, ½*o*	*l*, *cl*, *o*	Isocœlous; 2nd loop forms a left-handed spiral.
iformes	4	*l*, *cl*	*l*, ½*o*	½ *o*	Isocœlous.
.....	4	*l*, *o*	*l*, *o*	*o*	Isocœlous with plagiocœlous indications.
nulgidæ	3	*l*, *cl*	*l*, *cl* or ½ *o*	...	Isocœlous.
idæ	3	*l*, *cl*	*l*, *cl*	...	Isocœlous.
lidæ	3	*l*, *cl*	*l*, *cl*	...	Isocœlous, orthocœlous.
s...	3	*l*, *cl*	*l*, *o*	..	Mesogyrous, anticœlous.

The *Ratitæ* are a very heterogeneous group, because of t
diversity in the length and arrangement of the main gut an
development of the cæca. In none of these birds has it com
development of closed and well-defined loops of the mid-g
the exception of the duodenum). In this respect they r
the lowest type amongst the recent birds; to connect them
Reptiles would, however, be a far-fetched and futile attempt.
connections with recent Carinatæ are distant. Nearest of the
latter comes *Apteryx* through more defined loops, and the
seem to represent the link. The Gallinæ stand more distant.
Ratitæ agree with each other in having the second loo
handed, and the third left-handed; this is a feature which occ
only in the Crypturi, Gallinæ, *Opisthocomus*, and in the Cu

The *Gallinæ* form a well-defined group; lowest among th
the Neotropical Wood-fowls, and it is through them that
towards the Crypturi. The Gallinæ have also an unm
resemblance to *Opisthocomus* and thence to the Cuculidæ.

The *Turnices*, to which belongs undoubtedly *Pediono*
traceable to a Ralline or low Gralline stock, with assume
cœlous characters of the second loop.

The pericœlous assemblage is large. It is typically rep
by the Grallæ, of which the Limicolæ and the Rallidæ
principal groups. However, the configuration of their
folds as well as numerous other characters separate these tw
sufficiently to give them equivalent rank.

The *Rallidæ*, to which belong the Alectorides, are connec
the Turnices, more distantly with the Crypturi, and still mor
Apteryx. *Dicholophus* is in all points a Gruine form, like
and cannot be separated from them. *Rhinochetus* contains
Limicoline, and Ibis-like features; the only bird which it
somewhat closely in its very peculiar intestinal convolutions i

The *Limicolæ* agree with the *Laridæ*, and also with the
in all essential points. Each of these three groups contains
of forms which lead in an unbroken series from the typic
cœlous birds with four alternating loops to the typically me
birds. Most Columbæ and Laridæ are mesogyrous; *St*
its allies represent pericœlous or lower forms. Neither gra
nor insectivorous, nor piscivorous habits have exerted any ap
influence upon their intestinal convolutions, although of c
stomach and the cæca are affected. The presence of the cr
Columbæ is repeated in the granivorous limicoline genera *A*
Thinocorys.

It is interesting to note that *Limosa* and *Numenius* are
Limicolæ, and that *Numenius* approaches in various ways t
whence of course a continuous line can be traced into *Pla*
Phœnicopterus on the one hand and into the Pelargi prop
other.

Rather different from the Limicolæ are the *Pteroclid*
have four loops, which are all closed, left-handed, *i. e.* i
and straight; the second and fourth loops have their apic

and especially the terminal end of the second resembles some-
a plagiocœlous formation. The Pteroclidæ have consequently
us points in common with several rather diverse groups; they agree
the Rallidæ in having the 2nd and 3rd loops left-handed, but
from them and from the Limicolæ in having all the loops closed.
differ from the Rallidæ and agree with the Columbæ and lower
colæ in the number of loops. All this tends to indicate that
teroclidæ have branched off from the common Gralline stock
e the separation of the latter into Limicolæ and Rallidæ had
effect, and before either typical Columbæ or Gallinæ were
ped. That they have, in the diagram, to be placed in the
lous circle—which really belongs to totally different birds—
also that they have made an early and special departure.

e *Alcidæ* are pericœlous and strictly orthocœlous; they agree
he Laro-Limicolæ in the configuration of their first three loops,
ey differ from them in the number of loops, which is at least
e last three of which are left-handed. The Alcidæ seem to have
d from some low Limicoline forms and to have branched off
into a strictly orthocœlous direction. They are, in this respect,
r removed from the Laridæ (least so from the Terns), and
the term Gaviæ somewhat vague. They approach the *Pygo-*
(Colymbidæ and Podicipitidæ).

e Colymbidæ show unmistakable affinities with what may be
generalized or low Gralline forms; their five loops are closed,
cœlous, and alternating. The Podicipitidæ differ somewhat
the Colymbidæ, and besides possessing some special pecu-
es, approach the Grallæ more closely than do the Colymbidæ;
same time in the possession of a pyloric dilatation they have a
e in common with certain Fulicariæ and with the Steganopodes
Ierodii. A peculiar resemblance also exists between *Podiceps*
odica in the widely open and irregularly shaped last intestinal
All this assigns a lower position to the Podicipitidæ than to
olymbidæ, and gives them unequal rank, although the validity
name Pygopodes can be maintained. They connect the large
ne group with the following congregation, of which the Herodii,
nopodes, Tubinares, and Spheniscidæ are all divergent types.
y close connection exists between the *Herodii* and the *Steganо-*
, and this is supported by numerous other characters. The
ares are in more than one respect the most specialized outcome
great collective order, and reach in the typically mesogyrous
llariinæ their highest development; whilst *Puffinus* and
edea are more generalized, and *Ossifraga* takes up a somewhat
nediate position. There are, in this respect, striking resem-
es, of uncertain value however, with the Laro-Limicolæ; and
we arrive at the same conclusion as Fuerbringer, who assigns to
ubinares a position somewhat intermediate between but rather
t from the Laro-Limicolæ and Steganopodes.

e *Spheniscidæ* are now a very specialized group. They possess
iable characters in common with the Pygopodes, Steganо-
, and Tubinares; they are on the whole orthocœlous, but the

extreme length of their gut thrown into numerous straight and oblique or quite irregular, convolutions renders comparison very difficult. They have probably branched off very early from the main orthocœlous stock in the Antarctic region, and thus have had time to assume, through intense specialization, those pseudoprimitive characters in their whole organization which now separate the few surviving forms from the rest of the birds.

The *Lamellirostres*, to which belongs *Palamedea* as a probably very old member, are all orthocœlous, and combine peri- and plagiocœlous characters in their second loop. The five or six principal loops are alternating; the last four are closed and straight. As typically orthocœlous, aquatic birds, and as Præcoces, they agree of course with the Pygopodes, and the root of the stock of the Lamellirostres has to be looked for in this direction alone; they form, however, such a homogeneous, principally herbivorous, group, that they claim subordinal rank for themselves.

The *Pelargi*, containing the Hemiglottides (*Ibis* and *Platalea*), *Phœnicopterus*, and the *Ciconiæ*, are rather diverging forms, which can be characterized as possessing four very long and mostly closed loops (with occasional secondary loops intercalated), of which the first three or some of them have a tendency to coil their apical ends up into a more or less irregular spiral; this leads sometimes to an almost mesogyrous formation.

The *Hemiglottides* approach nearest to the Limicolæ, although their points of resemblance with *Numenius* may possibly be cases of convergence only. Very closely allied to, in fact inseparable from, the Hemiglottides, and connecting them with *Tantalus*, and thus with the Ciconiæ proper, is *Phœnicopterus*; there is not one single feature in the whole of the digestive system in which this bird differs from the Pelargi and resembles the Lamellirostres, except in the presence of small but functional cæca, which are nearly lost in the Pelargi. But these cæca stand in direct relation to the food of the Flamingoes, which consists of the confervæ in the mud of the lagoons. The zoophagous Pelargi have lost them, the phytophagous Flamingoes have preserved them.

The Ciconiinæ proper, represented by *Ciconia*, and connected with the former genera by *Tantalus*, are essentially telogyrous; their second loop is right-handed, and accompanies the duodenum; this is a rare feature, but considering that it occurs again only in the Gallinaceous group, and in some of their further allies, it must have been acquired independently by the Storks. It is of taxonomic value for the diagnosis of the subfamilies of the Pelargi.

The Pelargi are often classed with the Herodii, but these two families differ from each other in almost every point of primary importance. Since, however, each of them possesses various points in common with the Steganopodes, whilst they differ from each other in these same points, we have to conclude that the Pelargi, Herodii, and Steganopodes are three equivalent groups, which are distantly allied to each other, the relations between the two latter being closer than those of either with the Pelargi.

There remain, lastly, some unexpected resemblances between the largi and the *Diurnal Birds of Prey*; the chief connection is formed the telogyrous character, the mode in which additional loops of e lengthened gut are stowed away, and the tendency to convert ne or one of the principal loops into regular spirals. Amongst e Accipitres, the Old-World Vultures especially exhibit striking coniine similarities. As regards the Cathartidæ, I have to deplore nt of material. One badly preserved specimen of *Cathartes atus* differed greatly from the Accipitres in several particulars; e of the points being the widely open and pericœlous second loop, eature occasionally met with in the Hemiglottides.

Whatever may be the value of these resemblances between the largi and Raptores, they are the only points by which the Raptores be connected with the rest of the Carinatæ; therefore the view Garrod to let both form part of his order Ciconiiformes, which dopted by such an authority as Fuerbringer, becomes strengthened. is advisable to treat the Cathartidæ and Accipitres (*i. e.* the rest the *Raptores diurni*, *Serpentarius* not having been examined) as nivalent groups, and to combine them under the one name Rap-es.

The *Psittaci* are distinctly telogyrous; all their five principal ps are closed and alternating; this, with the presence of a crop, d the absence of functional cæca, are features which occur again gether only in the Accipitres. The absolutely vegetable food of e Parrots would sufficiently account for the differences which exist ween them and the entirely zoophagous Accipitres. However, s indication of a possible relationship between the Birds of Prey d Parrots is as little binding or satisfactory as other suggestions ed upon other organic systems. Parrots are Psittaci, and semi-ttacine forms, either recent or extinct, are unknown.

All the remaining Birds, viz. Garrod's Piciformes, Passeriformes, d Cypseliformes (with the addition of the Striges, Musophagidæ, d Cuculidæ, and after the exclusion of the Psittaci), have collec-ely been called Coracornithes by Fuerbringer. This I consider a at step in advance. They represent together the higher birds in position to those of lower organization, which, from a very broad nt of view, can be divided into two equivalent sets: 1, those chiefly restrial (all the Plagio- and Pericœlous birds, corresponding ghly with Fuerbringer's Alectorornithes + Charadriornithes); and those chiefly aquatic (all the typically orthocœlous birds = Fuer-nger's Pelargornithes). It is of course self-evident that such a ision of the Aves into three great sets can be maintained only on broadest phylogenetic basis, taking into account solely the fact t their organization gravitates towards three centres. Naturally, re can be nothing surprising in it that birds, which from all their ncipal points of organization point to one centre, have, owing to nge of habits, secondarily assumed characters which are primitive and typical of, another centre. Examples of such convergence are Laridæ, Accipitres, Pelargi, Striges, and possibly the Psittaci.

Concerning the "Coracornithes," it would be very difficult to

point out in a few words what are the points whi
with each other; but still, in spite of many imp
there is something in the organization of the whole
very system which tells the experienced eye that
them are allied together, and differ from the re
However, this sounds vague, and is not an exact mo
the affinities of the birds in question.

The lowest Coraciiformes are the *Coccyges*; this nam
comprises the Cuculidæ and the Musophagidæ. The *Cu*
four intestinal loops, of which the second and first are
The loops are on the whole orthocœlous, but the apic
middle ones are often turned up, or the second loop is
Moreover, they possess fully-developed cæca. In all t
they resemble to a great extent the Galliformes; and this
admirably strengthened by *Opisthocomus*, which is, bar
features, exactly intermediate between the Cuculidæ and
This is a conclusion which Huxley, Fürbringer, and o
arrived at on independent grounds. The *Musophagidæ*
only examined) possess but three loops, of which only t
right-handed. So far as the other two are concerned,
isocœlous birds, and agree in this point with the bulk of th
structure. The decreased number of loops of *Corythaix*
result of the shortening of the gut, a feature always connec
frugivorous habits. I consider that the second loop of the
like has been suppressed in the Musophagidæ, and that
finally their last two loops correspond with the third and fo
the Cuculidæ. The isocœlous feature of the Musophag
therefore reduced to a secondarily acquired one, and to a
convergence towards the typically isocœlous birds. The *Co*
are therefore, like *Opisthocomus*, birds which have sprung fro
Galliformous stock, and have followed lines of development w
are directed towards the Coraciiformes, and which in the M
phagidæ have attained their highest features.

The *Picidæ*, *Capitonidæ*, and *Rhamphastidæ* are very close al
and form the *Pici*. They differ, like the Epopes (Bucerotidæ
Upupidæ) from all the other Coraciiformes in the alternating p
two of their four loops, which, in the frugivorous Rhamphasti
and in the likewise extremely short-gutted genus *Upupa*, are reduc
to three by the suppression of the original second loop. *Xantholæm*
one of the Capitonidæ, has this second loop still indicated. Th
total absence of cæca in all these birds is a coincidence, whilst ther
are no obvious characters, besides the anticœlous convolutions, whic
point to a close relationship between the Pici and the Epopes.

There remains the large congregation which is, in the diagram
included in the isocœlous circle. Of these the *Coraciidæ* stan
nearest to the hypothetical ancestral or central stock, because they ar
the most generalized set, from which all the others can be derived
In one direction started from or out of the Coraciidæ the *Alcedinidæ*,
which have reached a truly mesogyrous formation. Their lengthened
gut, in conformity with their partly piscivorous habits, forms a le

d spiral in its second loop, whilst the fourth loop is long, and more piscivorous members widely open and irregularly placed. ffinity between the *Coraciidæ* and the *Alcedinidæ* in opposition er groups may be expressed by the term *Halcyones*; the frequent ence of blue non-metallic colour in these birds favours the ance of such a term.

Striges verge towards the plagiocœlous type, but all their es rest with the Coraciidæ and Caprimulgidæ combined. three families possess long cæca; the Alcedinidæ, Cypselidæ, rochilidæ have lost them, the first of these because of their rous and cancrivorous habits.

Caprimulgidæ, *Cypselidæ*, and *Trochilidæ* agree very much ach other. They are, however, all of equivalent rank. They e only three intestinal loops, which are short, in agreement with rincipally insectivorous habits. The Trochilidæ differ in the sion of a crop. The *Cypselidæ* and *Caprimulgidæ* are somewhat losely related to each other, and the latter (including *Podargus*) owards the Owls. The Cypselidæ are sometimes supposed to ewhat nearly allied to the Passeres. Their alimentary system ot altogether favour such a view; but perhaps the ancestors *is* once filled this gap, leaving their sole recent descendant a solitary position.

Trogonidæ stand on a lower level than the Cypselidæ, lidæ, and Coliidæ, on the same level as the Caprimulgidæ and idæ, and connect them all with each other. How much of mere coincidence, I am unable to decide, owing to want of al. The Trogons still possess well-developed cæca like the idæ, Caprimulgidæ, and Striges, whilst all the other Corac- es inside the isocœlous circle have lost them, or have only nless remnants of them.

cannot divide the whole host of Coracornithes into *Meno-* and *phla*, because the loss of the cæca does not indicate relation- nd has been produced independently by the absence or scarcity ulose or chitinous substances in the food taken.

Passeres are a very uniform group, equivalent to the Halcy- ici, Striges, &c. Their roots lie in the anticœlous assemblage, to the right than to the left in the diagram. They all possess ree loops, without indications of more; the second and third t-handed; the second becomes a left-handed spiral, the turns ich depend upon the length of the gut; the third loop is open, and invariably encloses the duodenum between its ding and ascending branches, the latter branch being situated ventral and left side of the descending branch of the duo- . This arrangement is invariably the same, even in the nyodians, and in such otherwise aberrant forms as *Rupicola* and

There is a special line which leads from the Laniine forms gh the *Austrocoraces* (*Gymnorhina*, *Graucalus*, *Strepera*, Para- e, &c.) into the *Coraces* proper, which latter have produced pecial modifications of the intestinal convolutions, and may ked upon as the last and highest blossom of the Avian tree.

EXPLANATION OF PLATE XXXII.

Diagrammatic representation of affinities of Birds according to their intestinal convolutions.

All the names between the two concentric rings refer to Birds which are cyclocœlous.

All the birds within the inner concentric circle are orthocœlous.

Underlined names refer to telegyrous formation.

Relationship is indicated by the excentric circles and by dotted connecting lines.

June 4, 1889.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1889 :—

The total number of registered additions to the Society's Menagerie during the month of May were 172 in number. Of these 121 were acquired by presentation, 6 by exchange, 9 by deposit, 21 by purchase, and 15 by birth. The total number of departures during the same period, by death and removals, was 124.

Amongst these I may call attention to an albino variety of the Cape Mole-Rat (*Georychus capensis*), presented to the Menagerie, May 1st, by the Rev. G. H. R. Fisk, C.M.Z.S. The ordinary colour of this Rodent is a uniform grey; the present specimen, however, is nearly pure white with black eyes. It lives entirely under the earth like a Mole, and is an interesting animal, though hardly suitable for public exhibition.

Mr. H. E. Dresser exhibited and made remarks on some eggs of the Adriatic Black-headed Gull (*Larus melanocephalus*) and of the Slender-billed Gull (*Larus gelastes*), which had lately been obtained at their nesting-places in the marshes of Andalusia by Col. Hanbury Barclay, F.Z.S., and himself.

The following papers were read :—

1. On the Mental Faculties of the Bald Chimpanzee (*Anthropopithecus calvus*). By George J. Romanes, F.R.S., F.Z.S.

[Received June 4, 1889.]

The female Chimpanzee, which has now been in the Society's menagerie for nearly six years [1], has attracted general notice, not only on account of her peculiar zoological characters, but perhaps still more on account of her high intelligence. This is conspicuously displayed by the remarkable degree in which she is able to understand the meaning of spoken language—a degree which is fully equal to that presented by an infant a few months before emerging from

[1] *Cf.* Bartlett, P. Z. S. 1885, p. 673, pl. xli.

ncy, and therefore higher than that which is presented by any
e, so far at least as I have met with any evidence to show.
ertheless, the only attempts that she makes by way of vocal
onse are three peculiar grunting noises—one indicative of assent
ffirmation, another (very closely resembling the first) of dissent
egation, and the third (quite different from the other two) of
ks or recognition of favours. In disposition she is somewhat
icious, though on the whole good-humoured, fond of her keepers,
apparently never tired of a kind of bantering play which off and
hey keep up with her continually. By vocalizing in a peculiar
otone (imitative of the beginning of her own "song"), they are
lly able to excite her into the performance of a remarkable
s of actions. First she shoots out her lips into the well-known
lar forms (depicted in Darwin's 'Expression of the Emotions,'
41), while at the same time she sings a strange howling note,
rupted at regular intervals: these, however, rapidly become
ter and shorter, while the vocalization becomes louder and louder,
ling up to a climax of shrieks and yells, sometimes accompanied
a drumming of the hind feet and a vigorous shaking of the
ork which constitutes her cage. The whole performance ends
a few grunts.

year or two ago it occurred to me that I might try some psycho-
al experiments on the intelligence of this animal. The circum-
ces in which she is placed, however, did not prove favourable
nything like systematic instruction. Being constantly exposed
ne gaze of a number of people coming and going, and having
attention easily distracted by them, the ape was practically
lable for purposes of tuition only during the early hours of the
ning, before the menagerie is open to the public; and, as a rule,
d not find it convenient to attend at that time. Therefore, the
lts which I am about to describe do not in my opinion represent
t might fairly have been expected under more favourable condi-
; if the Chimpanzee could have been kept as a domestic pet
few months (as I kept a Cebus kindly lent me for the pur-
s of psychological observation by this Society), there can be
oubt that many much more interesting results might have been
ined. Nevertheless, it appears to me that even those which
far have been obtained are worthy of being placed on record;
although some of them have already been published a few
ths ago in my work on 'Mental Evolution in Man,' since that
some further progress has been made; and therefore in the
ent paper I will state together all the facts which have been
erto observed.

aving enlisted the intelligent cooperation of the keepers, I re-
ted them to ask the ape repeatedly for one straw, two straws, or
e straws. These she was to pick up and hand out from among
litter in her cage. No constant order was to be observed in
ing these requests, but whenever she handed a number not
d for, her offer was to be refused, while if she gave the proper
ber her offer was to be accepted, and she was to receive a piece

of fruit as payment. In this way the ape was eventually taught to associate these three numbers with their names. Lastly, if two straws or three straws were demanded, she was taught to hold one straw or two straws in her mouth until she had picked up the remaining straw, and then to hand the two straws or the three straws together. This prevented any possible error arising from her interpretation of vocal tones—an error which might well have arisen if each straw had been asked for separately.

As soon as the animal understood what was required, and had learnt to associate these three numbers with their names, she never failed to give the number of straws asked for. Her education was then extended in a similar manner from three to four, and from four to five straws. Here, for reasons to be presently stated, I allowed her education to terminate. But more recently one of the keepers has endeavoured to advance her instruction as far as ten. The result, however, is what might have been anticipated. Although she very rarely makes any mistake in handing out one, two, three, four, or five straws, according to the number asked for, and although she is usually accurate in handing out as many as six or seven, when the numbers eight, nine, or ten are named, the result becomes more and more uncertain, so as to be suggestive of guesswork. It is evident, however, that she understands the words seven, eight, nine, and ten to betoken numbers higher than those below them; and if she is asked for any of these numbers (*i. e.*, above six), she always gives some number that is above six and not more than ten; but there is no such constant accuracy displayed in handing out the exact number named as is the case below six. On the whole, then, while there is no doubt that this animal can accurately compute any number of straws up to five, beyond five the accuracy of her computation becomes progressively diminished.

It is to be noticed that the ape exhibits some idea of multiplication; for she very frequently (especially when dealing with numbers above five) doubles over a long straw so as to make it present two ends, and thus to appear as two straws. Any of the comparatively rare errors which she now makes in dealing with numbers below six are almost invariably due to her thus endeavouring to duplicate her straws. In this connexion it is to be remembered that, owing to the method above described (whereby the ape is required to place each straw separately in her mouth until the sum asked for is completed), when any high number is demanded, a considerable tax is imposed upon her patience; and as her movements are deliberate while her store of patience is but small, it is evident to all observers that the doubling of the straws is intended to save trouble by getting the sum completed with greater rapidity than is possible when every straw is picked up separately. Of course we do not recognize these doubled straws as equivalent to two straws, and therefore the persistency with which she endeavours to palm them off as such is the more noteworthy as evidence of her idea of multiplication. Moreover, I am disposed to think that the uncertainty which attends her dealing with the numbers six and seven is more largely due to her

g patience than to her losing count; although after seven I
ve that her computation of the numbers themselves becomes
e, or merged in a merely general idea of many. It may also be
l that while picking up the straws and placing them in her
h she looks only at the straws themselves, and not at the
n who asks for them: therefore she is certainly not actuated
r responses by interpreting facial expression, unconscious ges-
&c., as is no doubt the case with many dogs which, on this
nt, are sometimes accredited by their owners with powers of
ught reading." It is needless to add that, after asking for
umber of straws required, we remain silent till the ape has
ed them out.

is not necessary—indeed it would be unreasonable—to suppose
n this process of "counting" the ape employs any system of
ion. We know from our own experience that there is counting
counting—*i. e.*, distinguishing between low numbers by directly
eciating the difference between two quantities of sensuous per-
on, and distinguishing between numbers of any amount by
ing each perception with a separate sign. The extent to which
ormer kind of computation can be carried in the case of man
een made the subject of a careful research by Prof. Preyer of
(Sitzungsb. d. Gesell. f. Med. u. Naturwiss. 1881). His experi-
e consisted in ascertaining the number of objects (such as dots
piece of paper) which admit of being simultaneously estimated
accuracy, and it was found that the number admits of being
ly increased by practice, until, in the case of some persons, it
rise to more than twenty. But, of course, in the case of a
it is not to be expected that such a high degree of proficiency
in this non-notative kind of "counting" should be attainable.
ntmost that could here be expected is that a brute should
it some such level of ability as is presented by a young child,
those savages whose powers of accurate computation do not
r to extend further than numbers which we write as units[1].
s in view of such considerations that I did not attempt to carry
ducation of this ape beyond the number five; and the result
h has attended subsequent endeavours to teach her numbers as
as ten is, as previously remarked, exactly what one might have
ipated. It may here be added that in the only records with
h I am acquainted of animals exhibiting any powers of numerical
utation, these powers have not extended beyond the number
Thus, for instance, in his well-known account of these powers
resented by rooks, Leroy says:—"To deceive this suspicious
the plan was hit upon of sending two men into the watch-house,
f whom passed out while the other remained [to shoot the bird
eturning to her nest]; but the rook counted and kept her dis-
. Next day three went, and again she perceived that only two
ned. In fine, it was found necessary to send five or six men to
watch-house in order to throw out her calculations"[2]. Again,

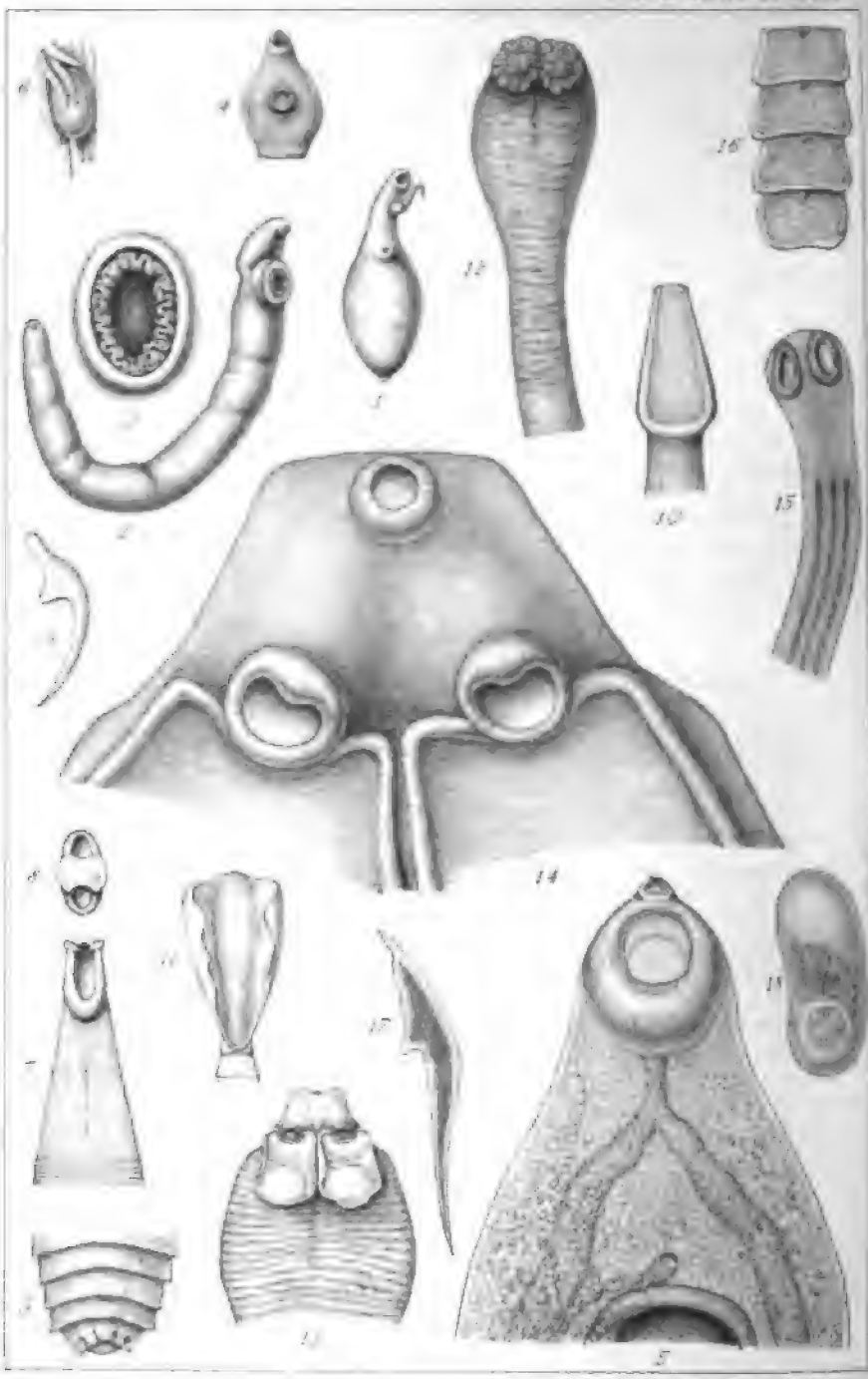
[1] See, for example, Galton, 'Tropical South Africa,' p. 213.
[2] "Letters," &c.

Houzeau tells us that mules used in tramways at New Orleans have to make five journeys from one end of the route to the other before they are released, and that they make four of these journeys without showing any expectation of being released, but begin to bray towards the end of the fifth [1]. Lastly, the keeper of the Sea-Lions now in the menagerie has recently taught one of these animals to "count" as far as five. His method is to throw pieces of fish in regular succession, which the animal catches one by one. He throws them in series of fives, and, before the commencement of any series, he tells the seal to miss the first, the second, the third, the fourth, or the fifth, as the on-lookers may dictate: the Sea-Lion thereupon makes no attempt to catch the member of the series thus verbally indicated. It is only a day or two ago, however, that I witnessed this performance, and as yet I am not satisfied that the Sea-Lion really "counts," because it appears to me probable that the keeper may unintentionally make some slight difference in his manner of throwing the piece of fish which he expects the Sea-Lion to miss, and that it is really this slight difference in the manner of throwing which the seal perceives and acts upon. Therefore, I intend to get an arrangement fitted up whereby the pieces of fish shall be thrown mechanically. But, whatever the result of this experiment may be, I think there can now no longer be any question that it lies within the capacity of animal intelligence to "count" correctly (in the sense already explained) as far as five, and even to show a well-marked appreciation—although progressively a more and more uncertain one—of numbers lying between five and ten.

The only other direction in which I have thus far subjected the Chimpanzee to psychological experiment has been in that of attempting to teach her the names of colours. It appeared to me that if I could once succeed in getting her thoroughly well to know the names of black, white, red, green, or blue, a possible basis might have been laid for many further experiments wherein these five colours could have been used as signs of artificially associated ideas. The result, however, of attempting to teach her the names of colours has been so uniformly negative, that I am disposed to think the animal must be colour-blind. It is perhaps desirable to state the facts which have led me to entertain this their most probable interpretation.

The method adopted in these experiments was to obtain from the importers of oriental matting a number of brightly and uniformly coloured pieces of straw—each piece being either white, black, red, green, or blue. Offered the straws two by two of different colours on each occasion, the ape was invited to select the straw of the colour named from the one whose colour was not named, and, of course, on choosing correctly was rewarded with a piece of fruit. In this way she quickly learnt to distinguish between the white straws and the straws of any other colour; but she never could be taught to go further. Now the distinction between the white straws and the straws of any other colour is a distinction which can be drawn by an eye that is colour-blind; and from the fact that

[1] Fac. Ment. des Anim. tom. ii. p. 207.



[illegible] PARA ENTOZOA

the ape is always able to perceive this distinction (she will search long and patiently for a straw of any colour when told that it occurs somewhere in the general litter of white straws constituting her bed, and eventually pick it out), while she cannot be taught to distinguish any of the others. I conclude that her failure in this respect is not due to any want of intelligence, but to some deficiency in her powers of colour-perception.

2. Notes on some Entozoa in the Collection of the British Museum. By Fr. Sav. Monticelli [1].

[Received May 18, 1889.]

(Plate XXXIII.)

Thanks to the courtesy of Dr. A. Günther I have been able to examine the helminthological collection of the British Museum (N.H.), and to study closely the typical specimens of von Siebold and Baird which are contained therein. On the present occasion I shall merely make some remarks upon a few of the more interesting new species or such as are not well known. Other observations I hope to embody n a larger forthcoming paper.

Trematoda.

1. Amphistomum truncatum, Rud. Ent. Syst. pp. 91 et 389.

I have found many specimens of this species taken from the intestine of a *Phoca vitulina*. My observations enable me to complete the description as follows:—Body elliptical, compressed or cylindrical, according to the state of preservation, with posterior extremity obtusely truncated and covered by fine spines, which in the anterior third are large, become gradually smaller in the middle third, and invisible in the posterior third.

Posterior sucker large, rounded, very prominent; pharynx of moderate size; œsophagus short; intestinal cæca long. The genital antrum placed in the anterior part of the body and surrounded by an elevated edge; it resembles a sucker; testes large and occupying the posterior part of the body; ovarium small, and uterus not much extended. Vitellaria disposed laterally and limited to the middle part of the body; vagina opening dorsally.

2. Distomum veliporum, Creplin, in Wiegmann's Archiv, 1842, p. 336, tab. ix.

There are in the collection specimens of this species found in the stomach (α) of an *Acanthias* (*vulgaris*?) presented by Dr. Chapman, (β) of a *Scymnus*, sp., from Madeira, (γ) of a *Torpedo fairchildi* from Dunedin (New Zealand), presented by the Otago University Museum; and in the body-cavity of a *Raja nasuta* from Dunedin (New Zealand). The *Acanthias*, *Torpedo fairchildi*, and *Raja nasuta* are new hosts

[1] Communicated by Dr. A. Günther, V.P.Z.S.

for this *Distomum*, which up to now has been found in the stomach only.

D. microcephalum, Baird (Cat. Ent. Brit. Mus. p. 98, pl. ii. fig. 2), from the stomach of *Acanthias vulgaris*, is, I think, based on small specimens of *D. veliporum*.

3. Distomum microporum, sp. n. (Plate XXXIII. fig. 1.)

Body elongated, pyriform, of a yellow colour, finely plicated transversely, with a small caudal appendage; in front very narrow and cylindrical, behind gradually enlarged and swollen; posterior extremity obtusely lanceolate. Anterior sucker large, circular, subterminal, situated entirely on the ventral surface; posterior sucker smaller than the anterior, circular, placed at the commencement of the posterior enlargement of the body. The small genital antrum is placed almost immediately behind the anterior sucker. Penis of moderate size, enlarged at the base. Excretory system opening at the extremity of body subdorsally. Lengths of the specimens 20–32 millim.

The six specimens of this new species were taken by Dr. Günther from a *Plagyodus ferox* from Madeira. Trematoda have not been previously observed in the *Plagyodontina*.

4. Distomum gigas, Nardo, Mem. sopra alcune nuove e rare specie di Entozoi, in Heusinger's Zeitsch. f. org. Physik, 1827, p. 68. (Plate XXXIII. figs. 2, 3.)

I give a figure of this rare species, which, so far as I know, has not yet been figured. The only specimen existing in the collection was taken from the stomach of an *Ausonia cuvieri* which was found on the British coast.

5. Distomum halosauri, Jeffrey Bell, Ann. & Mag. Nat. Hist. (5) xix. pp. 116–117. (Plate XXXIII. figs. 4, 5.)

Mr. Bell has described this species, found in the enlarged ends of the ureters of a *Halosaurus macrochir* dredged off Cape St. Vincent. I give a figure of this interesting species, and I add some remarks to Bell's description.

Anterior sucker small, globose, situated ventrally, presenting in front a pointed elevation, which, observed in a microscopical preparation, seems to be pierced by a cavity (see fig. 5). Posterior sucker as large or hardly larger than the anterior, circular, enlarged, prominent. Pharynx enclosed in the anterior sucker; œsophagus slender; intestinal cæca not very long. Testes in irregular outline; ovarium before the testes; uterus much extended through the body; genital antrum placed immediately before the posterior sucker.

Entozoa have not been before discovered in *Halosaurus*.

6. Didymozoon serrani, sp. n. (Plate XXXIII. fig. 6.)

This new species was found on the gills of a *Serranus fimbriatus* from Madeira; the same undescribed species I have frequently found attached to the gills of the *Serranus gigas* of the Gulf of Naples.

esent I give only a figure of this new species to ensure its ition. The detailed description, with anatomical remarks, e given in a forthcoming paper. The lengths of the cysts new species are 6–10 millim.

lymozoon serrani is the first species of this genus found in a the family Percidæ, the other known species inhabiting fishes families Scombridæ and Sphyrænidæ.

Cestoda.

Gyrocotyle rugosa, Diesing, Syst. Helm. vol. i. p. 480.

pecimen taken from the intestine of a *Callorhynchus antarc-* rom Dunedin (New Zealand). This very strange Cestode has to been found only in *Mactra edulis*.

Bothriocephalus macrobothrium, sp. n. (Plate XXXIII. , 8, 9.)

ad small, with the terminal cupula flattened; bothria lateral, prominent, with thick margin; neck very short, subcylindrical; flattened. Anterior segments very small, hardly to be dis- shed, becoming gradually more distinct towards the end of the The last segments not different in form from the preceding, little larger. Genital orifices lateral and in the anterior part of gments.

ngth of the specimens 16–20 centim.

e specimens were taken from the stomach of a *Trachypterus*, c., from Mauritius, presented by L. Bouton, Esq.

Bothriocephalus platycephalus, sp. n. (Plate XXXIII. 0.)

ad pointed, triangular, pyramidal, anteriorly truncated, without ct terminal cupula. Bothria large, much flattened, with in- ct fossette; neck very short, quadrangular; body flattened. ior segments small, the succeeding gradually larger; posterior n arcuate; genital orifices lateral. Lengths of specimens 115– illim.

e host of this new species is *Beryx decadactyla* of Madeira, which Entozoa have not been previously described.

Bothriocephalus tetrapterus, von Siebold, in Lehrbuch rgl. Anat. d. wirb. Thiere, Berlin, 1848, pp. 120, 143, 147, in . (Plate XXXIII. fig. 11.)

complete Siebold's description of this species, which inhabits *a vitulina*:—Head cordiform. Bothria lateral, enlarged, with ins expanded, so as to resemble four wings. Anterior segments zoidal, distinctly campanulate; the following rectangular, not anulate, the later decidedly quadrate. I have not observed ncomplete transverse division of the segments described by ld. The male and female generative organs are double in segment, with two distinct genital orifices, very small, situated

in the anterior third of the proglottis; exceptionally they are single, with a single genital orifice.

Length of complete specimen existing in the collection 55 millim.

11. TETRABOTHRIUM MACROCEPHALUM, Rudolphi, Ent. Hist. pt. iii. p. 61.

Tænia sulciceps, described and figured by Baird (P. Z. S. 1859, p. 111, pl. lvi. figs. 1, 1*a*, 1*b*) from the intestine of *Diomedea exulans*, is only a specimen of this species of Rudolphi, which had not previously been found in *Diomedea*.

Again, the *Tænia diomedea*, n. sp. (?), described recently by Linstow ('Challenger' Report, Entozoa, p. 13) from *Diomedea brachyura*, is a specimen of *Tetrabothrium macrocephalum*, and probably the *Tetrabothrium torulosum* described by the same author from *Diomedea brachyura* is only a synonym of the same worm.

12. PHYLLOBOTHRIUM CRISPATISSIMUM, sp. n. (Plate XXXIII. fig. 12.)

Very closely allied to *P. lactuca* and *P. tridax*, from which it may be easily distinguished by the larger head, the smaller bothria (which are extremely plicated with very small accessory suckers), by the broad and short neck, and by the very small size of the segments of the body, only gradually enlarged near the extremity of the body = the last segments are rectangular; genital orifices marginal.

Lengths of the specimens 140–190 millim. Unfortunately the host of this new species is unknown.

PELICHNIBOTHRIUM, gen. nov.

Head with a large pyramidal haustellum, anteriorly truncated and provided with a well-developed terminal sucker; bothria four, enlarged, like a basin, completely adherent to the head, each with an accessory sucker, scrobiculiform, and disposed in couples on each side of the head. The bothria of each couple are very near together.

13. PELICHNIBOTHRIUM SPECIOSUM, sp. n. (Plate XXXIII. figs. 13, 14.)

There are many specimens taken from *Alepidosaurus ferox*, from Madeira. I was unable to discover true segments of the body or the generative organs.

14. TÆNIA FALCIFORMIS, Baird, Cat. Entoz. Brit. Mus. p. 116; P. Z. S. 1853, p. 24, pl. xxx. fig. 3. (Plate XXXIII. fig. 17.)

Baird described the rostellum of this *Tænia* as unarmed, but with a mark of doubt. I have observed that the rostellum, elongated, conical, and anteriorly subrounded, is armed with eight very slender and long hooks of a very characteristic form; the neck is indistinct; the genital orifices are marginal.

15. TÆNIA CALVA, Baird, Cat. Ent. p. 83; P. Z. S. 1853, p. pl. xxxi. figs. 1, 1*a*. (Plate XXXIII. figs. 18, 19.)

There are in the collection numerous specimens of this sp

n the intestine of *Lagopus scoticus*. The small rounded head distinct from the long neck, provided with four circular and uckers, has the rostellum armed with a small crown of very ous and minute hooks (Baird said the rostellum was unarmed). nital orifices are marginal, on one side. The ova are small, ; contents a very small embryo, occupying about the fiftieth the total contents of the ova.

TÆNIA MAGELLANICA, sp. n. (Plate XXXIII. figs. 15, 16.)

pose this name for a species of *Tænia* collected in Magellan by Dr. Cunningham. This species, of a brown colour, 20–28 in length, is thus characterized:—Head subclavate, ros- not apparent; suckers large, as wide as the head; neck deli- moderate length. Anterior part of the body thin, posterior lly enlarged; anterior segments small, following rectangular, trapezoidal. Genital orifices lateral, very small, and not easy gnize.

TÆNIA BIFARIA, von Siebold, MSS.? (Baird, Cat. Ent. p. 79).

interesting species has been, so far I know, not yet described. aracterized as follows:—Head small, triangular, with a conical, l, unarmed rostellum and a very small sucker; neck short. or segments small, narrow, gradually enlarged and rectan- last segments subquadrate. The generative organs are dupli- n each segment, with the genital orifices, which are lateral and ient, on either side. The penis-sheath is large; the penis of ate size, armed with fine spines.

gths of the specimens taken from the intestine of *Nyroca thalma* 39–90 millim.

EXPLANATION OF PLATE XXXIII.

Distomum microporum, sp. n., nat. size, p. 322.
—— *gigas*, nat. size, p. 322.
—— ——, posterior sucker, × 3, p. 322.
—— *halosauri*, × 3, p. 322.
—— ——, anterior part of the body; from a microscopical preparation, p. 322.
Didymozoon serrani, sp. n., nat. size: attached to the gills of *Serranus fimbriatus*, p. 322.
Bothriocephalus macrobothrium, sp. n., head, × 6, lateral view, p. 323.
—— ——, head, × 6, anterior view, p. 323.
—— ——, last segments, × 3, p. 323.
—— *platycephalus*, sp. n., head, magnified, p. 323.
—— *tetrapterus*, head, magnified, p. 323.
Phyllobothrium crispatissimum, sp. n., head, magnified, p. 324.
Pelichnibothrium speciosum, g. et sp. n., head, × 6, p. 324.
—— ——, head from a microscopical preparation, p. 324.
Tænia magellanica, sp. n., head, magnified, p. 325.
—— ——, last segments, p. 325.
—— *falciformis*, a hook, magnified, p. 324.
—— *calva*, ova, much magnified, p. 324.
—— ——, a hook, much magnified, p. 324.

3. List of Birds collected by Mr. Ramage in Dominica, West Indies. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received May 13, 1889.]

I lay on the table a set of the birds collected, in 1887 and 1888, in the island of Dominica, West Indies, by Mr. George A. Ramage, the Naturalist employed by the joint Committee of the Royal Society and British Association for the investigation of the Fauna and Flora of the Lesser Antilles.

The specimens are 116 in number, and belong to the following 30 species:—

*1. Mimocichla ardesiaca (*Vieill.*).
2. Myiadestes dominicanus, *Stejn.*
3. Margarops montanus (*Vieill.*).
4. Oinclocerthia ruficauda, *Gould.*
5. Thryothorus rufescens, *Lawr.*
6. Dendrœca melanoptera, *Sharpe.*
7. Dendrœca plumbea, *Lawr.*
8. Setophaga ruticilla (*Linn.*).
9. Vireosylvia calidris (*Linn.*).
10. Certhiola dominicana, *Taylor.*
11. Saltator guadelupensis, *Lafr.*
12. Loxigilla noctis (*Linn.*).
13. Phonipara bicolor (*Linn.*).
14. Elainea martinica (*Linn.*).
15. Myiarchus tyrannulus (*Müller*).
16. Blacicus brunneicapillus, *Lawr.*
17. Tyrannus rostratus, *Scl.*
18. Eulampis jugularis (*Linn.*).
19. Eulampis holosericeus (*Linn.*).
20. Thalurania wagleri (*Less.*).
21. Orthorhynchus exilis (*Gm.*).
22. Coccyzus minor (*Gm.*).
23. Chrysotis bouqueti (*Wagl.*).
24. Chrysotis augusta, *Vigors.*
25. Buteo pennsylvanicus (*Wils.*).
26. Tinnunculus caribbearum (*Gm.*).
27. Zenaida martinicana, *Bp.*
28. Chamæpelia passerina (*Linn.*).
29. Butorides virescens (*Linn.*).
*30. Nyctiardea violacea (*Linn.*).

The most complete list of the birds of Dominica is that published by Mr. G. N. Lawrence in 1878 [1]. It contains the names (or synonyms of the names) of all the above-mentioned species except two, namely *Mimocichla ardesiaca* and *Nyctiardea violacea*. As regards the latter of these, the species is of wide distribution, and is known to occur in others of the Lesser Antilles [2]; there is no reason therefore to remark on its being found also in Dominica. But *Mimocichla* is, I believe, quite a novelty in the Avifauna of the Caribbean group of islands. This genus contains four species, and has hitherto been supposed to be restricted to the Greater Antilles, *M. rubripes* and *M. schistacea* being its representatives in Cuba, *M. plumbea* in the Bahamas, and *M. ardesiaca* in San Domingo and Porto Rico. As might have been expected, the Dominican *Mimocichla* belongs to the Porto Rican form. It is, in fact, so nearly similar that I do not see sufficient grounds for making it specifically distinct. The only difference apparent is the much greater whiteness of the belly in the Dominican specimens, whence those who adopt trinomials would, no doubt, call it *Mimocichla ardesiaca albiventris*. Mr. Ramage has sent home two male examples of this bird, which were both procured at "Batalie, dry region to leeward," in March 1889.

[1] "Catalogue of the Birds of Dominica from collections made for the Smithsonian Institution by Fred. A. Ober," Proc. U. S. N. M. 1878, p. 48.

[2] See Cory, Birds of the West Indies (1880), p. 249.

e known species of birds of the island of Dominica are about number, of which about 35 are Passeres, Picariæ, and Psittaci. ese five appear to be absolutely restricted to the island :—

Blacicus brunneicapillus.	*Chrysotis augusta.*
Thalurania wagleri.	—— *bouqueti.*
Chætura dominica.	

sides these there are two peculiar subspecies, namely *Mimocichla iaca albiventris* and *Margarops montanus rufus*. The great re in the Dominican Ornis is the sole possession of two species peculiar group of large Parrots of the genus *Chrysotis* which is cted to the Lesser Antilles, namely *C. augusta* and *C. bouqueti*. e other two known members of this group, St. Vincent has one *uildingi*) and Santa Lucia one (*C. versicolor*). There ought to representative of this group also in Martinique, but it is not nown to us. It is perhaps extinct. Besides the species and ecies restricted solely to Dominica, this island has many other iar forms in common with its near neighbours of the Lesser les. These will be found enumerated in Mr. Lawrence's ctive index and analysis of the birds contained in Mr. Ober's tions (Proc. U. S. N. Mus. 1878, p. 486), and in Cory's s of the West Indies.'

June 18, 1889.

rof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

e Secretary exhibited, on behalf of Mr. J. F. Green, F.Z.S., a fine example of the Common Eel (*Anguilla vulgaris*) obtained a pond at Lee, Kent, as mentioned in 'The Field' of August 1888.

. B. B. Woodward exhibited and made remarks upon a draw- *Ærope caffra*, a carnivorous Snail from the Cape Colony, taken an example lately living in this country.

. B. B. Woodward also exhibited an example of a fossil shell the Eocene of the Paris Basin, *Neritina schmideliana*, and a n showing its peculiar mode of growth.

. Eadweard Muybridge exhibited a number of projections with xy-hydrogen Lantern. These had been selected from his ela- e work on Animal Locomotion now being prepared for publication the auspices of the University of Pennsylvania, and illustrated ssive phases of motion, such as occur during a single stride of alk, amble, trot, gallop, &c., of Horses, Dogs, Elephants, and animals, both wild and domestic, and of birds while flying.

These projections had been taken by an automatic electro-photographic apparatus with a regulated and exactly equal period of time between the phases, which are photographed synchronously from two or more points of view. With this apparatus thirty-six illustrations had been made of a horse while jumping a hurdle; each of twelve phases illustrating the complete action having been simultaneously photographed from the side, front, and rear. Twenty-four consecutive phases of the wing of a bird while flying had also been photographed, the time-intervals of each successive phase being recorded by an electro-chronograph.

The following papers were read:—

1. On a supposed new Genus and Species of Pelagic Gadoid Fishes from the Mediterranean. By Henry H. Giglioli, C.M.Z.S.

[Received May 25, 1889.]

(Plate XXXIV.)

Eretmophorus[1], gen. nov.

Body moderately elongate, tapering in older specimens towards the tail; covered with small adherent cycloid scales marked with concentric lines, and not extending to the head and abdomen, which are naked. *Abdomen prolonged in a great cone,* much more developed in the older specimens; at its extremity, nearly opposite to the small first dorsal fin, is the anal aperture and behind this a small conical papilla. A separate caudal, lanceolate in the younger specimen, subtruncate in the older one; two dorsals and one anal fin; the second dorsal and anal largely and equally developed. Pectorals lobate; ventrals jugular, singularly developed, with five rays, *three of which, and more especially the third and fourth, are greatly elongated and furnished at the end with a beautiful lanceolate paddle-like blade.* Vertex of head and nape with small hyaline cylindrical warts. Teeth very small, few and inconspicuous, on premaxillæ and end of mandible. Branchiostegals seven. No barbel.

Eretmophorus kleinenbergi, sp. nov. (Plate XXXIV.)

I. D. 4. II. D. 73. A. 73. C. 26. P. 22. V. 5. B. iv. Brs. vii.

Body compressed, tapering towards the tail, but less so in the younger specimen, in which the huge and singular abdominal cone is also less developed. The height of the body behind the abdominal cone is contained between 5½ and 6 times in the total length exclusive of the caudal fin. The *lateral line* extends nearly in a straight line from the branchial cleft to the end of the root of the tail; it is merely marked as a furrow with indistinct pits along its course; in

[1] Ἐρετμὸς (*remus*), oar; φορὸς (*ferens*), carrier.

rger specimen at its cephalic end two slight furrows run
l with it above and beneath. *The head* is moderate, rather
its length is contained about 5 times in the total exclusive of
udal fin; the snout is short, nearly equal to the transverse
er of the eye, its anterior contour is rounded; there is a slight
gibbosity in front over the mouth. This is moderate, its
re hardly reaching the vertical from the anterior margin of
e. Nostrils in front and a little above the eye, the posterior
re largest and oval. Eye moderate; behind it, extending
s the nape and downwards along the preoperculum, are two
f conspicuous pores. The space between the eyes is nearly flat
ther broader than the diameter of the eye; behind, the nape
onvex, presenting a median furrow in front of the first dorsal
older specimen. On the nape, in the larger specimen, are a
r of very distinct hyaline cylindrical warts, just like those of
ia except in shape; the latter have been described by Professor
[1] and are nearly hemispherical. In *Eretmophorus* they begin
hind the interocular space and appear to form a double series;
older specimen I counted eight, but a few more extend towards
ad of the lateral line; they are evidently sense-organs allied
e of the lateral line. In concluding I must state that these
re not to be seen on the two younger specimens, in which
ppear to be represented by pores, more numerous and more
t than in the older and larger specimen.

gill-openings are rather wide, the branchiostegal membranes
gely developed, with robust rays; the opercular bones are
and very thin; the branchial cavities contain four complete
. The specimens are so very fragile that I did not dare to
my investigations further.

fins are those of an Anacanthine fish, but I could not see
nsverse articulations in the first ray of the first dorsal; they
very distinct on the other median fins except on the caudal,
y fin with slightly bifid rays; in the other fins the rays are
; at the base of the long dorsal and anal fins the projecting
of the interspinous bones give rise to a serrated appearance.
st dorsal is small, but quite detached from the second one in
larger specimens, it rises just above the insertion of the pec-
its second ray is the longest and equals in height the
ncement of the second dorsal fin. This is greatly developed
intains a nearly equal line throughout, but as the body tapers
s the tail the fin increases in height in equal ratio. In size,
and development the anal is the exact counterpart of the second
fin. The caudal fin is quite distinct, its contour is lanceolate in
aller specimen, nearly oval in the older one, subtruncate with
d edges in the oldest or biggest specimen. The pectorals are
tly lobate, which character is more marked in the smaller
ens; they are of moderate size and broadly oval in contour.
ntrals certainly give the most striking feature to this singular

[1] Emery, "Contribuzioni all' Ittiologia," in Mittheil. a. d. Zool. Station
el, vi. p. 157, tav. 10. ff. 18, 19. Naples, 1885.

fish; they are inserted below and in front of the pectorals, at the base and on each side of the great abdominal cone. They are of great size, and the very robust rays, five in number, are all elongated and considerably exceed the intervening membrane, which only unites their basal portions; the internal and external rays are considerably less developed than the three median ones, the internal one is the shortest; both are simple and without any trace of terminal dilatations. The three median rays all terminate in a large beautiful lanceolate leaf-like blade, through which, however, the ray continues to the pointed extremity; they are all prolonged far beyond the two first mentioned rays, but the outer one is considerably shorter than the other two, it is smooth and its terminal blade is smaller The third and fourth rays, counting from the outer one, are subequal, and bent backwards extend very nearly to the root of the tail; at about the basal third of their length they both present a singular angular dilatation, which looks like a thickened articulation, but which is merely, so far as I can make out, a membranous dilatation. The great lanceolate terminal blades are very large, being little less than one fourth of the total length of the ray which supports them; their edges are sinuous and they terminate in a fine point. Judging from their length, strength, and development, these ventral paddles must be most efficient for swimming; I know of no other fish possessing anything like them, and have therefore thought proper to derive from so peculiar a character the generic name which I have proposed for this singular fish.

The next remarkable feature of my *Eretmophorus* is the huge abdominal cone, the base of which occupies the entire space between the insertions of the ventrals and that of the anal fin. This cone appears to develop with age, and it is certainly larger and more prominent in my oldest and biggest specimen, equalling in height that of the body just behind the pectorals, where it is greatest. This abdominal cone is quite smooth; its skin, devoid of scales, is silvery. I have not ventured to open it in any of the three specimens yet discovered, for fear of damaging to a certainty these rare and very delicate creatures; but the supposition that it contains most of the alimentary canal cannot be far from the truth; at its apex, which becomes cylindrical, is an aperture, evidently the vent, and behind this a slender conical papilla on which I could not distinguish anything like an opening.

The *scales* cover the whole body except the head and abdominal cone, which are, as I have said before, naked. They are small, very adherent, cycloid, and marked with concentric lines. I have figured a few magnified (Plate XXXIV. fig. 1), to give an exact idea of their characters; they are very similar to those of *Hypsirhynchus hepaticus*, Facciolá. A thin pellucid epidermal layer covers them.

Only three specimens of *Eretmophorus kleinenbergi* have, so far as I know, yet been captured and preserved; they were caught alive with a hand-net along with other pelagic animals on the surface at the mouth of the harbour of Messina, as the current was flowing in. I owe them to the kindness of my friend Professor Nicolaus Kleinen-

berg, director of the Zoological Institute of the Messina University, to whom I owe many other ichthyological rarities; and as a mark of my gratitude and esteem I have thought proper to give his name to so singular a species, which is evidently as yet undescribed. These specimens are now in the Central Collection of Italian Vertebrata in the Royal Zoological Museum at Florence. As they present differences in size and in other respects, I shall proceed to describe them briefly.

My smallest specimen (Plate XXXIV. fig. 2) measures 28½ millimetres in total length; it was caught on the 10th of May, 1887. It is evidently much younger than the other two; the two dorsals are yet united and the larval median fin extends as a crest to the head; the caudal is, however, quite distinct and remarkable for its lanceolate form. The abdominal cone is comparatively smaller than in the two older specimens, and a membrane unites its hinder portion to the anal fin. The lobe of the pectorals is very distinct, and the rays look thickened at their distal ends. The ventrals have the characteristic form and development. The colour of the body is yellowish white (in alcohol); eight very distinct broad black bands cross the body transversely, being slightly oblique: the first occupies the base of the abdominal cone, the last the root of the tail; the 4th, 5th, 6th, and 7th are continued as a black blotch on the base of the anal fin; the ventral paddles are tipped and edged with black, the ray is, however, white; otherwise the fins are colourless. Looking with a lens, these black bands and blotches result in an accumulation of dark points or chromatophores; this is the case also in the other specimens.

The second specimen, according to size and age, measures 68 millimetres in total length; it is figured slightly enlarged (Plate XXXIV. fig. 3). It was captured alive near the surface in the harbour of Messina on the 2nd of June, 1888. It bears considerable resemblance to the first specimen described, but has lost some of the larval characters above noted; all the median fins are well distinct, the caudal has an oval contour; but the abdominal cone, covered with a slightly silvery skin, shows still a posterior membranous fringe which partially unites it with the anal fin. The pores on the head and nape are very distinct. In colour this specimen is also very similar to the first one; the black transverse bands are very well marked, but they are slightly fainter and the first one does not extend to the abdominal cone, which is well developed. Ten very distinct black blotches extend along the base of the anal fin and three along the caudal end of the second dorsal; three additional blotches are on the back between the 3rd and 4th, 5th and 6th, and 6th and 7th transverse bands.

The third specimen has the aspect of an adult. It was caught also near the surface at the entrance to the harbour of Messina at the end of April 1884. It measures 78 millimetres in total length; head 16 millimetres; from nape to apex of abdominal cone 27 millimetres; height of body immediately behind the abdominal cone 12 millimetres. I have figured it once and a half the natural size (Plate XXXIV. fig. 4). It differs especially in colour from the two younger and

smaller specimens; the transverse dark bands on the body and blotches along the median fins are faintly marked. The paddles of the ventral fins are tipped with blackish brown, and were edged with violet in the fresh specimen; the general colour of which was a faint pink, with yellowish tinge along the basal half of the dorsal and anal fins. The abdominal cone is bright silvery; it has no trace of a hind marginal membrane. The caudal is subtruncate; and, lastly, the cylindrical hyaline warts on the nape are very prominent and distinct.

I believe that *Eretmophorus* belongs to the GADIDÆ and approaches that section to which *Haloporphyrus* and *Physiculus* belong. I am, however, inclined to think that its nearest ally may be the strange pelagic Gadoid described a few years ago ('Naturalista Siciliano,' iii. pl. 2) by my friend Dr. L. Facciolá, from a single specimen got also at Messina, and named *Hypsirhynchus hepaticus*, Facc. Later two more specimens were got at Naples, and I have one. *Hypsirhynchus*, which deserves to be more fully described, has much the size and shape of *Eretmophorus*, but there is no abdominal cone and the ventrals have seven rays, some of which are slightly prolonged and end in a rounded head; but no fish that I know of possesses anything like the beautiful lanceolate ventral paddle-like blades of *Eretmophorus*.

EXPLANATION OF PLATE XXXIV.

Fig. 1. Enlarged scales of *Eretmophorus kleinenbergi*.
2. Younger specimen, natural size.
3. Nearly adult specimen, slightly enlarged.
4. Oldest or adult specimen, once and a half natural size.

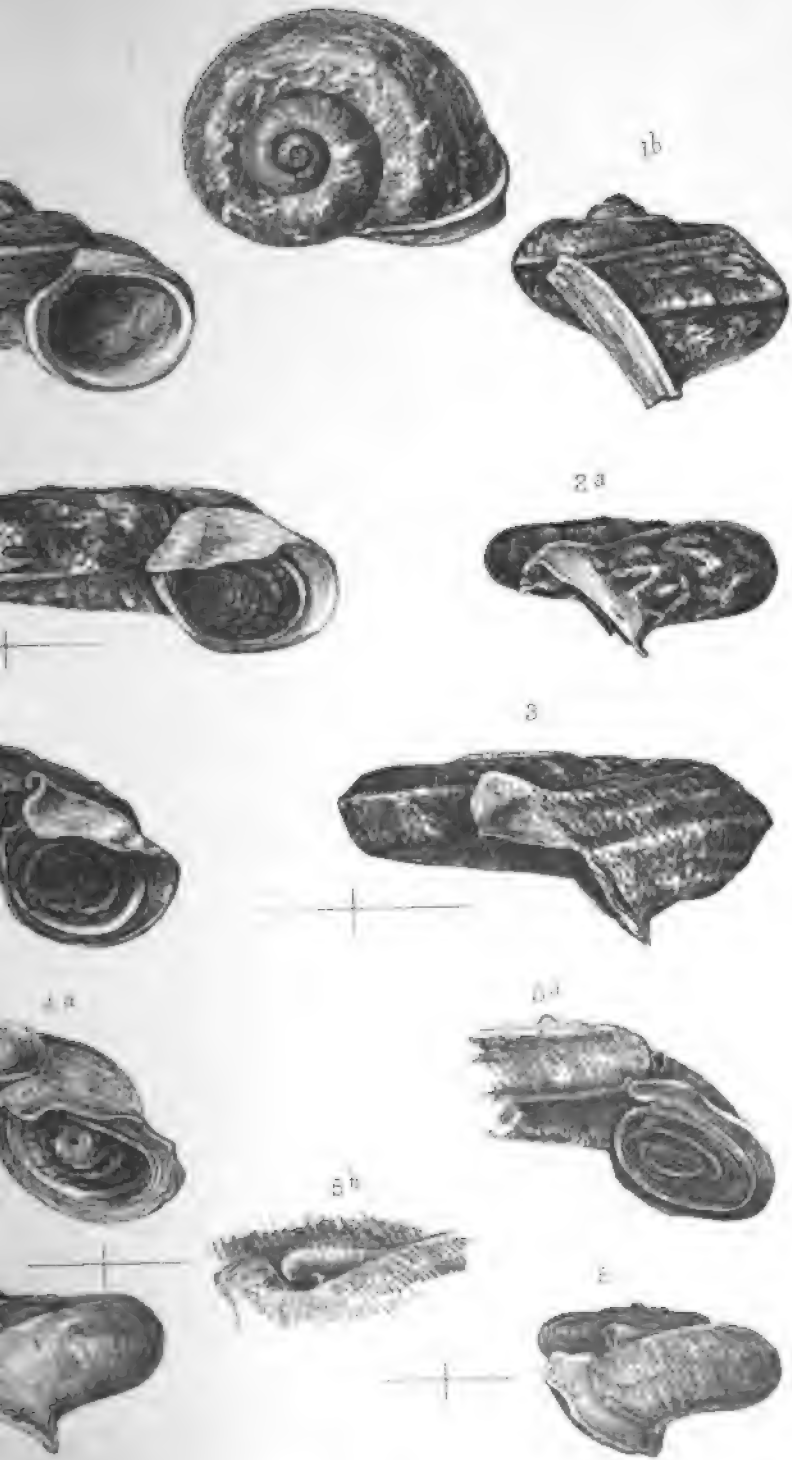
2. On a Collection of Land-Shells made in Borneo by Mr. A. Everett, with Descriptions of supposed new Species. By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.—Part I. Cyclostomacæ.

[Received June 1, 1889.]

(Plates XXXV.–XXXIX.)

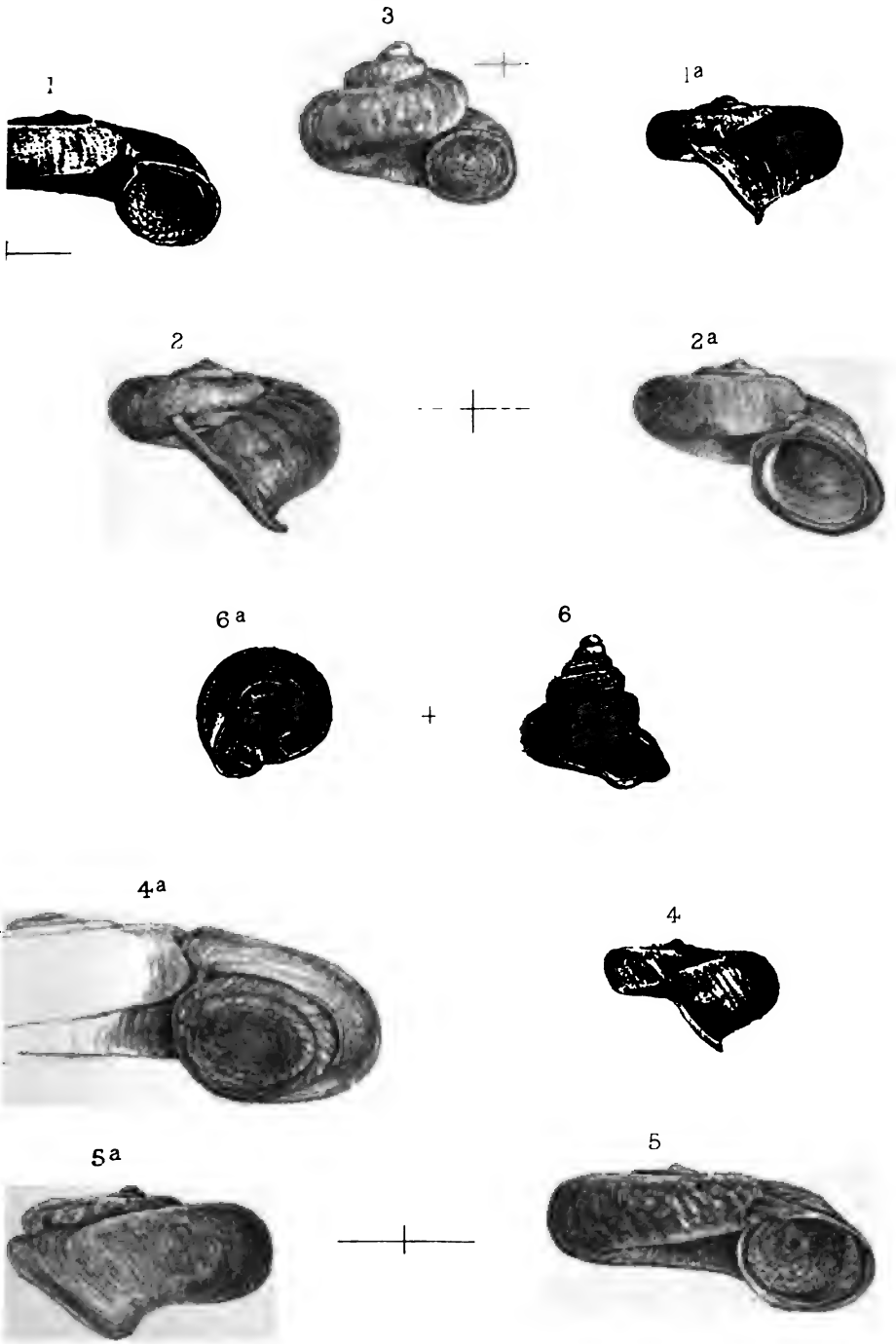
INTRODUCTION.

This truly fine collection was brought home in 1888 by Mr. A. Everett, and he very kindly let me see it, and handed it over to me for the identification of the species. In this work, which has been delayed from various causes, I have been assisted very materially by Dr. R. Hungerford, who had a better and previous knowledge of the shells from that part of the world, and had in his collection examples of a good many Bornean species obtained from Sir James Low, Mr. Boxall, and other sources. Mr. Edgar Smith has also given me much aid in looking over and comparing these shells with those in the British Museum collection, and to both my sincere thanks



NEW BORNEAN LANDSHELLS

1



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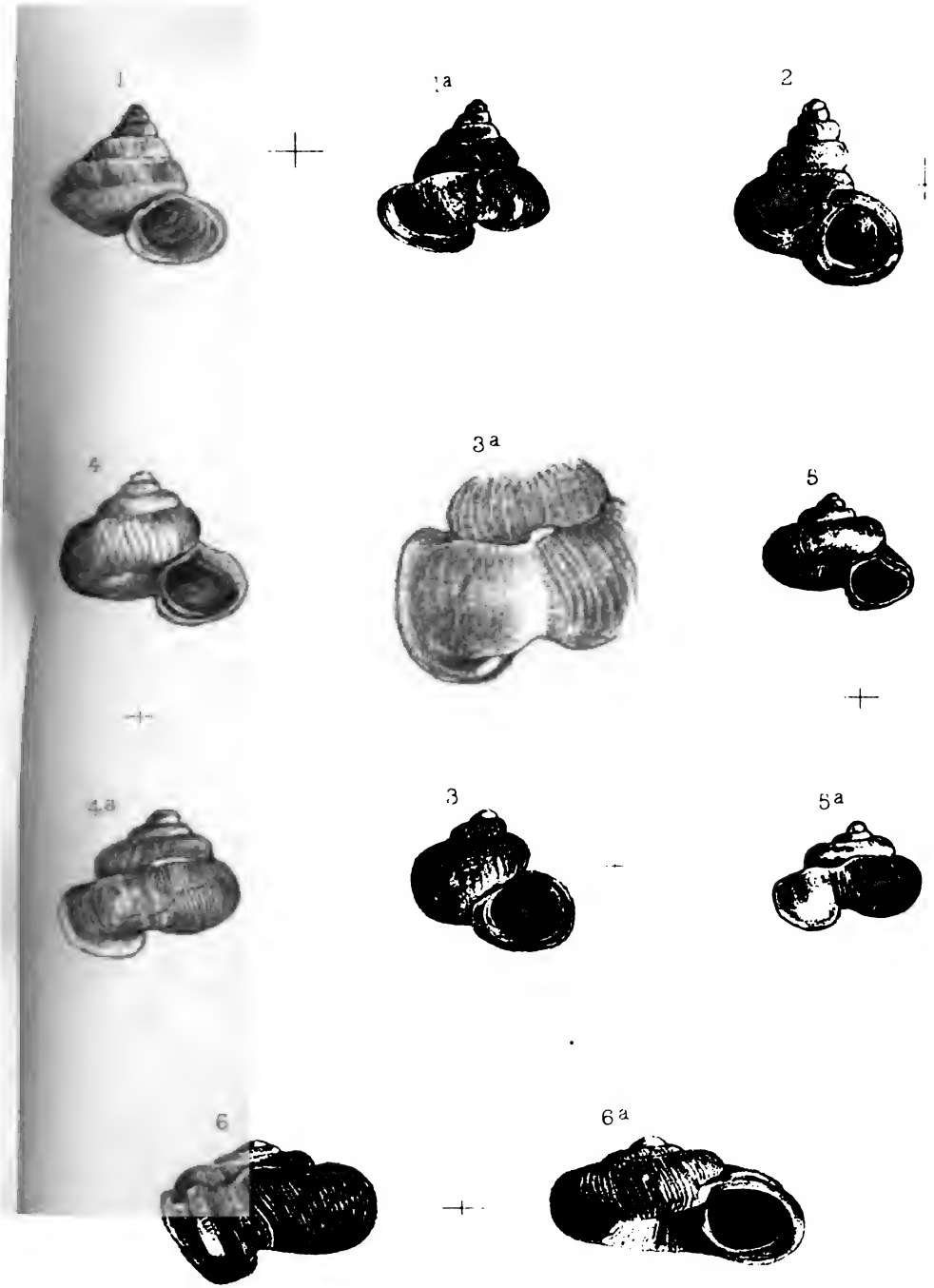

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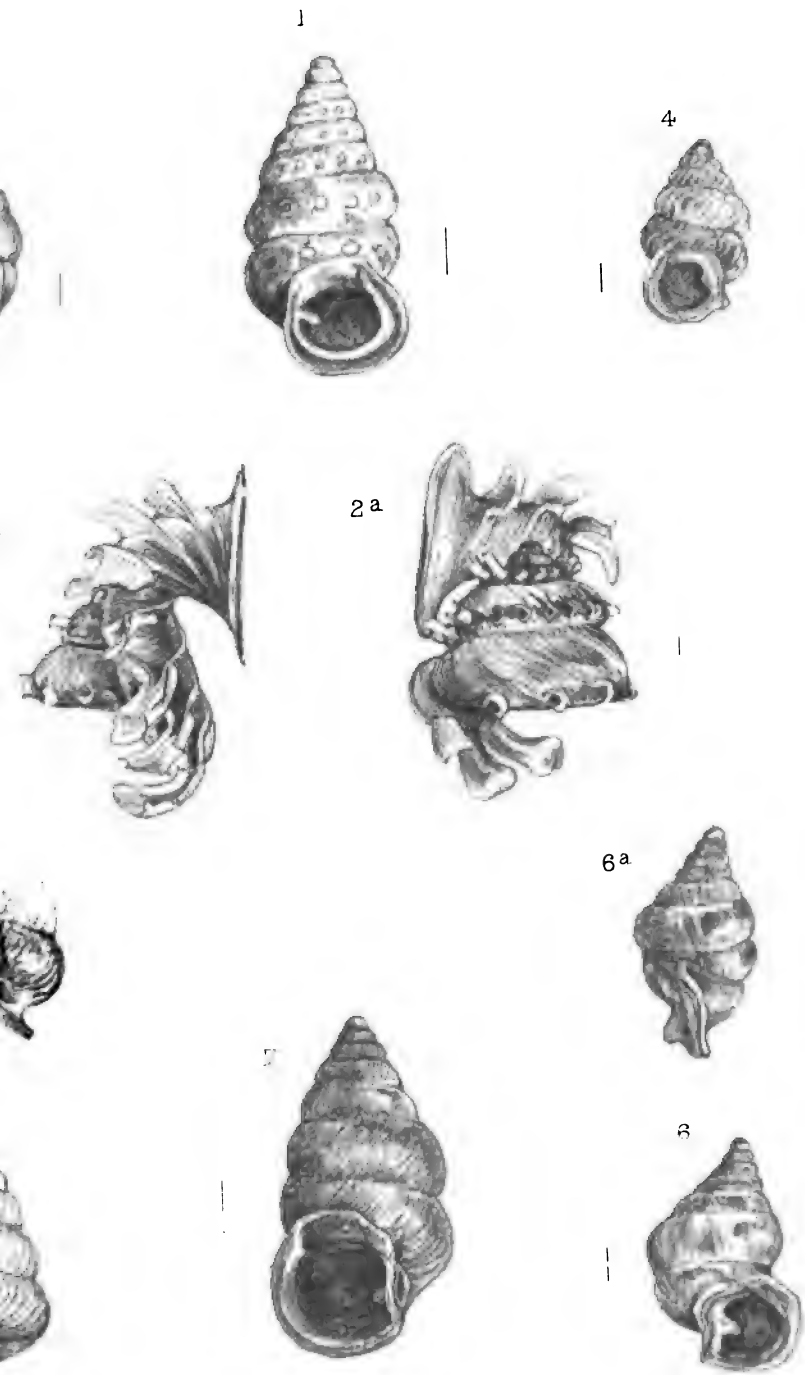

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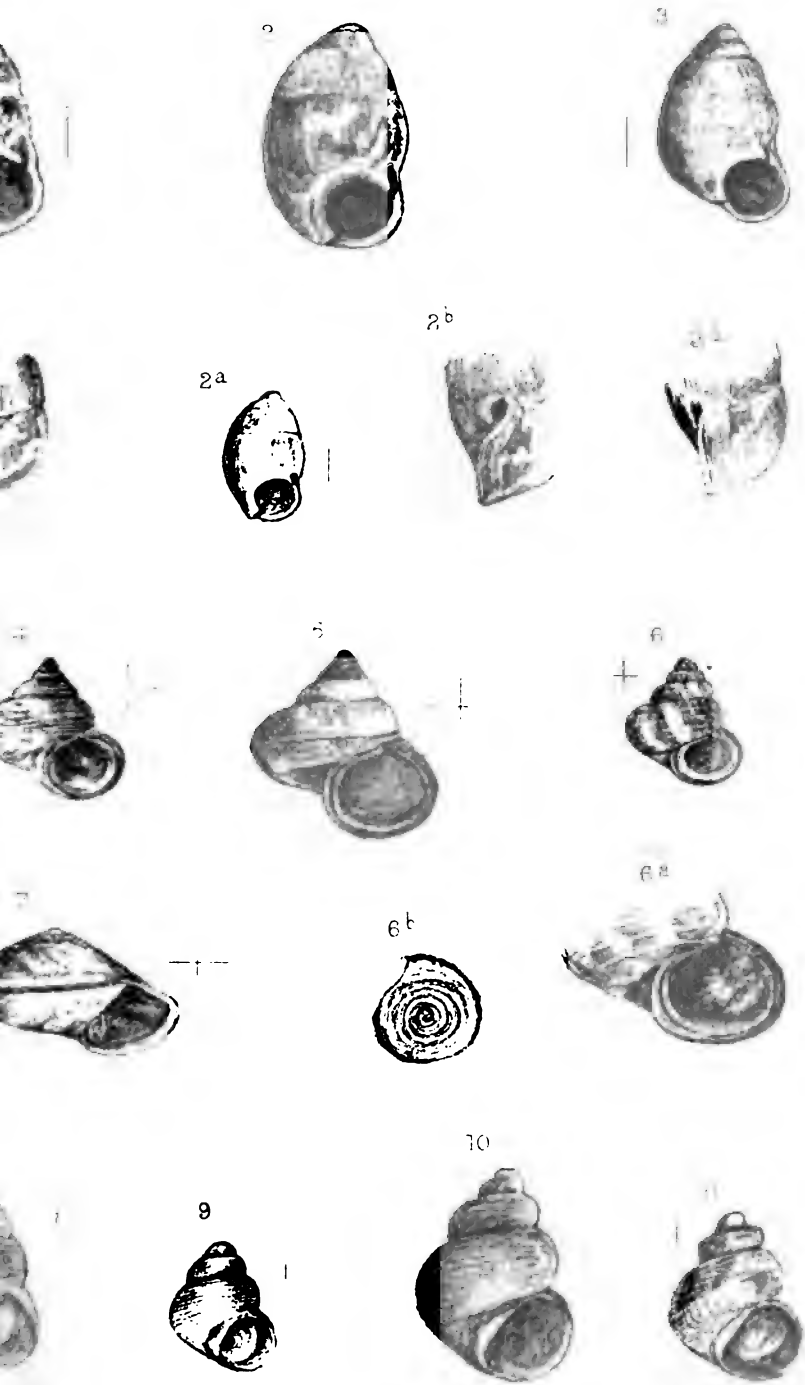

NEW BORNEAN LANDSHELLS

e due. The excellent catalogue (with plates) of Bornean shells mpiled by Signor A. Issel in 1874 from the collections brought gether by Signor G. Doria and Signor O. Beccari has been of great e and forms the basis of my work. I include in this paper all the ecies not seen by me, but there enumerated, with the names printed italics, so as to bring the record up to date. I have also included the species mentioned as from Borneo in Tenison-Woods's "Malay-n Land and Freshwater Mollusca" (Proc. Linn. Soc. N. S. Wales, . 2, vol. ii. pp. 1003–1095)—an imperfect list as regards Borneo.

Some years ago I had placed in my hands by Mr. John Evans all e shells obtained by Mr. Everett when he was exploring the lime-ne caves in Borneo; these shells were all much weathered and in very unsatisfactory state to name and describe, and it was desirable at a better knowledge of the living forms of Borneo should be first tained before doing so. The specimens thus dug out of the floors of ese caverns are now referred to in this paper.

Mr. Everett at my request preserved a good number of his land-ells in spirit, and I am thus enabled to describe the anatomy of me of the Zonatidæ that I have had time to examine, which e of much interest. The greatest credit is due to Mr. Everett for ding so largely to our knowledge of the Molluscan Fauna of Borneo, his labours have furnished us in this first part alone with no less an 34 new species, besides a very large number of other shells tained by previous naturalists and collectors, some of which were re and little known. Mr. Everett is returning to Borneo, and with is excellent commencement and foundation for future exploration ll no doubt add many more to the novel and extremely interesting t of shells he has already discovered there.

He has written me the following short description of the country, hich gives an idea of its physical features. The accounts of the me district in the Journals of Rajah Sir James Brooke also indicate at it is a sort of paradise for land-shells, where numberless new ecies are yet to be found with proper search at the proper season, d when the hill-ranges are thoroughly explored.

"The 'plain' at Labuan is simply an open grassy space bordering Victoria Harbour and representing the original clearing of the ttlement. It is composed partly of sea-sand and partly of old angrove-mud and is intersected by ditches, which are often quite y in the fine season, and in the rainy season are alternately filled ith rain-water and with brackish or even purely salt-water according the state of the tides. The plain seems to have been originally ampy and covered with mangroves and white Casuarines on the ndy portions. The Busan Hills are situated perhaps a dozen miles om the sea as the crow flies, between Tegora and Kuching in Sarawak. hey attain an elevation of about 500 feet, and are covered with old rest and the usual lower undergrowth, except where the scarps are o steep to admit of the lodgment of soil or of decaying vegetation. he rock is compact limestone, the surface of which is much fretted y the action of the rains, and where not exposed to direct sunlight usually covered to a greater or less degree with a variety of mosses.

Size: maj. diam. 39, min. 20; alt. axis 13·5; body-whorl alt. 18·25 millim.

Hab. Molu Hills (*Mr. Hose; coll. Hungerford*).

Only one specimen. This is the most distinct species as compared with *C. borneensis* that I have yet had to describe. I have named it after the H.E.I. Co.'s steamer, which was with the fleet under Rear-Admiral Sir T. Cochrane.

Leptopoma, Blanf.

7. Leptopoma bicolor, Pfr.

Cyclostoma bicolor, Pfr. P. Z. S. 1852, p. 145, pl. xiii. fig. 9; Mart. u. Chem. Conch.-Cab. ed. ii. p. 374, pl. xlviii. figs. 25-27.

Leptopoma bicolor, Reeve, Conch. Icon. pl. ii. fig. 13 (1862).

Hab. Unknown. In British Museum. Borneo according to Pfeiffer.

8. Leptopoma lowi, Pfr.

Leptopoma lowi, Pfr. P. Z. S. 1853, p. 70; Reeve, Conch. Icon. pl. vii. fig. 38.

Hab. Dahat Island (*Everett*); Labuan (*Low*).

8 *a*. *Leptopoma signatum*, Pfr.

Cyclostoma (*Leptopoma*) *signatum*, Pfr. P. Z. S. 1856, p. 338.
Leptopoma signatum, Reeve, Conch. Icon. pl. vii. fig. 40.

Hab. Borneo? (*Pfr.*).

In British Museum collection.

9. Leptopoma sericatum, Pfr.

Cyclostoma (*Leptopoma*) *sericatum*, Pfr. P. Z. S. 1851, p. 24.
Leptopoma sericatum, Reeve, Conch. Icon. pl. v. fig. 26.

Hab. Usukan Island, Niah Hills, Sarawak, Busan Hills, Low Island, Tiga and Karamon Island (*Everett*).

As Issel points out, the varieties of this species are numerous: he gives five, but I observe a certain constancy in those from different localities.

In the collection before me there are 96 from Tiga Island, 84 of which are quite white, with numerous fine very pale grey bands, var. E of Issel; in 12 the shell has a general pale brown appearance, from the bands being darker and crossed by transverse lines of the same colour, near var. B of Issel.

From Karamon Island there are 3 specimens similar to var. B.

From the Niah Hills 76 specimens are sent; in all, more or less, the banding is conspicuously marked, and in 68 the bands are narrow and regular, var. B; 3 are like var. D of Issel (Moll. Born. pl. vi. fig. 12), with one broad band on the periphery; while 5 are violet-brown, the spiral ribbing strong, near var. A of Issel.

From Sarawak proper, 8 specimens present a violet tinge, are

in, the banding obsolete, and one is ornamented with a single rk narrow band on the periphery.

Another box from Sarawak contains 13 specimens; 2 are large, of violet-tinted variety, the rest are small in size; 8 have a greenish t and finely banded olivaceous, 2 are quite white with violet apex, nas a single very broad dark band.

From the Busan Hills 7 are similar to those from Sarawak, last ntioned, greenish tinted.

Four came from Usukan; 2 are like var. B from Tiga Island, but aller; 2 are exactly like var. C of Issel (pl. vi. fig. 10).

From Low Island, Mantanani group, the form differs most, having raised spiral ribbing, rather large in size, delicate, thin, pale, nsparent shells; var. E of Issel.

9 *a*. LEPTOPOMA WALLACEI, Pfr.

Compared with the example in the British Museum.

This banded species occurs in Dr. Hungerford's collection. It is ly a variety of *L. sericatum*, with a broad band above the periphery; her shells may be picked out with the band below it.

10. LEPTOPOMA UNDATUM, Metcalfe.

Cyclostoma undatum, Metcalfe, P. Z. S. 1851, p. 71.
Leptopoma undatum, Reeve, Conch. Icon. pl. iv. fig. 21 (1862).
Hab. Sarawak (*Everett*).

Leptopoma bourguignati, Issel.

Leptopoma bourguignati, Issel, Moll. Born. Ann. Mus. Civ. Genova, p. 428, pl. vi. figs. 7, 8 (1874).
Hab. Sarawak, 2 examples (*Doria and Beccari*).

Leptopoma subconicum, Pfr.

Leptopoma subconicum, Bock, P. Z. S. 1881, p. 634.
Hab. Mindai (*Carl Bock*).

Leptopoma massena, Less.

Leptopoma massena, Bock, P. Z. S. 1881, p. 634.
Hab. Mindai (*Carl Bock*).

Leptopoma duplicatum, Pfr.

Leptopoma duplicatum, Bock, P. Z. S. 1881, p. 634.
Hab. Borneo (*Carl Bock*).

Leptopoma whiteheadi, E. A. Smith.

Leptopoma whiteheadi, E. A. Smith, Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 133 (1887).
Hab. Northern Borneo (*Whitehead*).

Lagocheilus, Blanf.

Although the notch at the sutural margin of the peristome is very small and less apparent than in the typical Indian species, yet it is there, and in all characters agrees with the genus *Lagocheilus* as described by W. T. Blanford.

11. Lagocheilus dido, n. sp. (Plate XXXIX. fig. 5.)

Shell turbinate, rather thin, umbilicated narrowly; sculpture covered with a stony epidermis, smooth, with a distinct rib on the periphery, extending on to the penultimate whorl: colour amber-brown; spire high, sides flat; apex pointed; suture impressed; whorls 6, moderately convex, the last subangulate, and angulate below round the umbilicus; aperture circular, subvertical; peristome double, with a slight sutural notch, the outer lip slightly expanded and reflected at right angles.

Size: maj. diam. 10·0; alt. axis 7·0; diam. apert. 5·5 millim.

Operculum not preserved in the only two specimens before me.

Hab. Niah Hills (*A. Everett*).

I have named this shell after H.M.S. 'Dido,' the officers and crew of which, on the first occupation of Sarawak by Rajah Brooke, did good service in the suppression of the pirates who then infested those waters.

12. Lagocheilus keppeli, n. sp. (Plate XXXIX. fig. 4.)

Shell globosely turbinate, rather solid, translucent, closely umbilicated; sculpture a thick epidermis set with very fine short hairs, 5 or 6 delicate longitudinal lirate ribs, crossed by regular diagonal raised striæ; colour dull ochraceous ochre, apex dark; spire high, sides flat; apex fine; suture moderately impressed; whorls $5\frac{1}{2}$, rounded; aperture circular, nearly vertical; peristome double, inner continues simple, with a very minute notch showing within the aperture; columellar margin rounded, the outer lip slightly reflected.

Size: maj. diam. 8·25, min. 6·75; alt. axis 6·0 millim.

Operculum thin, flat, transparent, spiral of about 8 turns.

Hab. Niah Hills (*A. Everett*).

This shell is named after Captain the Honourable Henry Keppel, of the 'Dido,' whose name occurs often in the early history of Sarawak and that part of Borneo.

13. Lagocheilus mundyanus, n. sp. (Plate XXXIX. figs. 6, 6 *a*, 6 *b*.)

Shell dextral, moderately solid, conical, closely umbilicated; sculpture very minute transverse striæ, with at distant intervals a fine costulate rib, very conspicuous in the very young shells, becoming obliterated with age; four fine spiral liræ ornament the last whorl, with one below the periphery, very minute short hairs are given off from the points of intersection of the lirate bands and the transverse rib, but these are lost as the shell grows older; colour pale olivaceous, crossed by transverse bands of dark liver-

rown; spire conic; apex rather sharp; suture impressed; whorls 5, des convex; aperture circular, milling white within; peristome in-stinctly double, the outer lip slightly expanded, with a very small otch at the sutural margin; columellar margin rounded.
Size: maj. diam. 3·20; alt. axis 4·0 millim.
Operculum flat, thin, horny, transparent, multispiral.
Hab. Busan Hills (*A. Everett*).

Craspedotropis, Blanf.

14. Craspedotropis barbatus, Pfr.

Cyclostoma (*Leptopoma*) *barbatum*, Pfr. P. Z. S. 1855, p. 104.
Leptopoma barbatum, Reeve, Conch. Icon. pl. vii. fig. 42 (1862).
Hab. Niah Hills, Sarawak (*A. Everett*).
This is very close to *C. metcalfi*, Issel.

Craspedotropis bellulus, v. Martens.

Cyclophorus bellulus, v. Martens, Monatsber. d. Berlin. Akad. 865, p. 52; Preuss. Exped. Ost-Asien, Die Landschnecken, p. 104, . ii. fig. 18 (1867).
Hab. Near Bengkajang, Pandon Mountain.

Craspedotropis metcalfi, Issel.

Cyclophorus metcalfei, Issel, Moll. Born. Ann. Mus. Civ. Genova, . p. 432, pl. vi. figs. 4–6 (1874).

Craspedotropis confluens, Pfr.

Cyclophorus confluens, Pfr. P. Z. S. 1860, p. 140; Reeve, Conch. on. pl. xv. fig. 69 (1861).

Pterocyclos, Benson.

15. Pterocyclos lowianus, Pfr.

Pterocyclos lowianus, Pfr. P. Z. S. 1863, p. 526.
In Dr. Hungerford's collection. Very similar to *Pt. tenuilabiatus*. his species has never been figured.

16. Pterocyclos tenuilabiatus. (Plate XXXV. figs. 4, 4*a*.)

Cyclostoma tenuilabiatum, Metcalfe, P. Z. S. 1851, p. 71.
Pterocyclos tenuilabiatus, Reeve, Conch. Icon. pl. i. fig. 5 (1863).
Pterocyclos anomalus, Reeve, Conch. Icon. pl. v. fig. 27 (1863).
The type is in the British Museum.

17. Pterocyclos sumatranus, v. Martens.

Pterocyclos sumatranus, v. Martens, Monatsber. Berlin. Akad. 864, p. 115; Preuss. Exp. Ost-Asien, Die Landschnecken, p. 115, l. i. fig. 5 (1867).
Pterocyclos endœdaleus, Crosse, Journ. de Conch. 1869, p. 187, t 1871, p. 67, pl. 1. fig. 2.

18. Pterocyclos labuanensis, Pfr.

Pterocyclos labuanensis, Pfr. P. Z. S. 1863, p. 525.
This species does not appear to have ever been figured.

19. Pterocyclos mindaiensis, Bock.

Pterocyclos mindaiensis, Bock, P. Z. S. 1881, p. 634.

Near *P. loweanus*, Pfr., but larger.

20. Pterocyclos niahensis, n. sp. (Plate XXXV. figs. 3, 3 *a*.)

Shell dextral, discoid, very widely, perspectively umbilicated; sculpture a thick epidermis, crossed by stony lines of growth; colour umber-brown, with narrow zigzag markings crossing the whorls at regular intervals; apex not raised above the succeeding whorls; suture shallow; whorls 5, subangulate at the periphery, with a raised rib upon it, two similar less defined ribs above and three on the underside; aperture circular, very oblique; peristome double, inner continues simple, the outer much expanded and reflected, particularly on the upper margin, where it forms one strong sutural fold, which a very slight further development would convert into a tube, it then falls over in front forming a frontal lappet, with sinuate edge.

Size: maj. diam. 27·75, min. 23·0; alt. axis 5·5; body-whorl 11·5 millim.

Operculum dark brown, multispiral, with coarse raised edges in front, deeply concave below.

Hab. Niah Hills (*A. Everett*).

This species is very like *P. cucullus* at first sight, but its keeled and ribbed whorls and the very different form of the winged expansion of the peristome separate it.

A shell very similar occurs in the Molu Hills. It differs in three particulars, viz. in the form of the wing, being less developed into the tubular form; in the apical whorls being depressed below the succeeding whorls; in the coloration being of a darker tint with broader zigzag blotchings. This I distinguish as var. *depressus*. This shell was first found by Mr. Boxall and given to Dr. Hungerford, who presented a specimen to the British Museum, which I have seen.

21. Pterocyclos cucullus, n. sp. (Plate XXXV. figs. 2, 2 *a*.)

Shell dextral, flatly discoid, very amply and perspectively umbilicated; sculpture a thick epidermis with fine lines of growth; colour pale sienna, with broad flame-like zigzag markings crossing the whorls transversely; apex perfectly flat; suture impressed; whorls nearly 5, rounded, rather rapidly increasing; aperture oblique, circular; peristome double, the inner continuous, simple, the outer sharply reflected and increasing in breadth on the outer margin, and the upper, where it droops over into a cowl-like shape, having one single depression or fold.

Size: maj. diam. 26·0, min. 22·0; alt. axis 5·5; diam. ap. 8·5 millim.

Operculum very dark brown, multispiral, with raised edges.

Hab. Niah Hills.

Pterocyclos eudædalus, Crosse, Journ. Conch. xvii. 1869, p. 187.

Hab. Borneo.

Pterocyclos planorbulus, Lam. Encycl. Méth. pl. 461. fig. 3.
Hab. Borneo?

OPISTHOPORUS, Benson.

22. OPISTHOPORUS BICILIATUS, Mousson.

Pterocyclos biciliatus, Mousson, Moll. v. Java, p. 49, pl. xx. g. 9; Reeve, Conch. Icon. pl. iv. fig. 17 (1863).
Cyclostoma taylorianum, Pfr. Zeitschr. f. Malak. 1851, p. 7; Mart. u. Chemn. Conch.-Cab. ed. ii. p. 288, pl. xxxviii. figs. 27–29.
Cyclostoma (*Pterocyclos*) *charbonnieri*, Récluz, Journ. de Conch. 851, p. 214, pl. v. figs. 12, 13.
Cyclostomus spiniferum, Morelet, Journ. de Conch. 1861, p. 177.

Opisthoporus latistrigus, v. Martens.
Cyclotus latistrigus, v. Martens, Monatsber. d. Berlin. Acad. 1864, 116.
Opisthoporus euryomphalus, v. Martens (not Pfr.), Preuss. Exp. st-Asien, Die Landschnecken, p. 111, pl. 1. fig. 6 (1867).

23. OPISTHOPORUS EURYOMPHALUS, Pfr.

Cyclostoma (*Opisthoporus*) *euryomphalus*, Pfr. P. Z. S. 1856, 337.
Pterocyclos euryomphalus, Reeve, Conch. Icon. pl. v. fig. 29 1863).
Compared with type in Cuming Coll., Brit. Mus.

Opisthoporus pertusus?, Morelet.
Cyclostoma pertusum, Morelet, Journ. de Conch. ix. p. 177 1861).
Cyclostoma spiniferum, Morelet, Journ. de Conch, ix. p. 177 1861).

24. OPISTHOPORUS PTEROCYCLOIDES, Pfr. (Plate XXXV. figs. 5 *a*, 5 *b*.)

Cyclostoma pterocycloides, Pfr. P. Z. S. 1854, p. 300.
Pterocyclos anomalus, Reeve, Conch. Icon. pl. v. fig. 27 (1863).
Var. quite plain.
Hab. Niah Hills (*A. Everett*).

25. OPISTHOPORUS BIROSTRIS, Pfr.

Cyclostoma birostre, Pfr. P. Z. S. 1854, p. 300.
This species is in Dr. Hungerford's collection: it does not appear o have been figured anywhere.

Opisthoporus rostellatus, Pfr.

Cyclostomus rostellatum, Pfr. Zeitschr. f. Malak. 1851, p. 8; Mart. u. Chemn. Conch.-Cab. p. 289, pl. xxxviii. figs. 30–34.
Pterocyclos rostellatus, Reeve, Conch. Icon. pl. v. fig. 25 (1863).
In Brit. Mus.

RHIOSTOMA, Benson.

26. RHIOSTOMA CAVERNÆ, n. sp. (Plate XXXVI. figs. 1, 1*a*.)

Shell dextral, discoid, rather solid, very widely and perspectively umbilicated; sculpture smooth, with fine transverse lines of growth; colour pale umber-brown; spire just raised above last whorl; apex flat; suture well impressed; whorls 4, well rounded, the last separated from the others for a distance of 4 millim., the sutural tube lying about midway, rather nearer to the aperture, it is short and recurved; aperture circular, oblique; peristome double, inner simple, continuous, the outer expanded on the exterior margin and into a very slight wing at the sutural side.

Size: maj. diam. 15·0, min. 10·5; alt. axis 3·25; diam. body-whorl 6·0 millim.

Operculum multispiral, shelly in front and slightly convex, double, horny, polished, multispiral at inner side.

Hab. Sarawak proper.

The first specimens sent home by Mr. Everett were four in number, obtained when making excavations in certain caves in the limestone formation, and marked Cave A. The specific name is only given in allusion to this work, not that the species habitually lives in such places. These are somewhat larger than the one described and figured, being in major diam. 19 millim., minor diam. 14 millim.

27. RHIOSTOMA GWENDOLENÆ, n. sp. (Plate XXXVI. figs. 2, 2*a*.)

Shell dextral, globosely discoid, solid, openly umbilicated; sculpture a thick finely striate epidermis; colour dark umber-brown, with transverse bands of a darker colour, towards the apex zigzag bars are seen where this epidermis has come off; spire low; apex papilliform; suture well impressed; sutural tube 2 millim. in length, tapering and directed forward; whorls 4¼, rounded, the last separated from the other whorls from the base of sutural tube; aperture circular; peristome double, the inner lip thin and continuous, the outer expanded and reflected on the outer margin.

Size: maj. diam. 15·25, min. 11·75; alt. axis 5·0; diam. body-whorl 7·5 millim.

Operculum thin, flat, smooth, multispiral, and shelly in front, smooth and horny behind, with a central circular hole.

Hab. Niah Hills (*A. Everett*).

Only one specimen in the collection, which is quite distinct from all other species of this genus from Borneo in its more closely round and globose form.

28. RHIOSTOMA HUNGERFORDI, n. sp.

Shell discoid, umbilicated; colour rich dark madder-brown, crossed with broad regular V-shaped markings for 4 whorls, where the varix of an old aperture is seen; in front of this the markings are less developed; spire perfectly flat; apex papillate, scarcely raised above the succeeding whorls; suture well impressed, the tube small, adhering

to the penultimate whole, curved downward and pointed; whorls 4, rounded, the last leaving the penultimate at the sutural tube 7 millim. from the aperture; peristome double, the outer thin and much expanded at right angles to the whorl.

Size: maj. diam. 23·0, min. 16·80; alt. axis 4·0; body-whorl alt. 9·5 millim.

Hab. Borneo (*coll. Hungerford*).

This shell is in Dr. Hungerford's collection and was sent to him from the Molu Hills by Mr. Boxall.

29. Rhiostoma iris, n. sp.

Shell depressedly turbinate, openly and perspectively umbilicated; colour deep ochre, with regular zigzag bands of ruddy brown crossing the whorls; spire just raised above the last whorl; apex blunt; suture well impressed; whorls 4, rounded, the last separated from the penultimate for about 5 millim. from the aperture, where the sutural tube rises, this is short, horizontal, and directed forwards; aperture oblique; peristome double, continuous, inner simple, outer expanded at right angles to the body-whorl, more particularly on the outer margin, and increasing to a crinkled expansion or wing on the upper margin and directly in front of the sutural tube, this wing terminates abruptly on the columellar side.

Size: maj. diam. 18·25, min. 14·0; alt. axis 5·75 millim.

Operculum with a smooth central spot, multispiral, shelly, flatly concave.

Hab. Borneo (*coll. Hungerford*).

The exact locality where this shell was collected is not known to me, but it is distinct from all the other species with which I am acquainted.

Cyclotus, Swains.

Dr. Ed. v. Martens, after separating the American forms under Troschel's genus *Aperostoma*, divides this genus (as represented in India and the Malay Archipelago) into four very distinct groups, based on the shell characters. The differences that exist are not sufficient to found new subgenera, and I follow his grouping now because it is certainly an aid to the identification of the species.

1st Group. *Cycloti pterocycloidei.*

Shell of depressed form, widely umbilicate, with the peristome reflected, forming a more or less well-developed wing above.

30. Cyclotus boxalli, n. sp. (Plate XXXVI. figs. 4, 4 *a*.)

Shell dextral, discoid, very openly and perspectively umbilicated; sculpture a thick epidermis with fine lines of growth; colour rich dark madder-brown; spire papillate; apex slightly raised above the last whorl; suture deeply impressed; whorls 5, well rounded, regularly increasing; aperture oblique, circular; peristome double, inner very thin, simple, continuous on columellar margin with the outer lip, this last gradually expanding and reflected on the lower and outer

margin at right angles to the body-whorl, and at last forming a flat broad wing, with a shallow fold near the suture.

Size: maj. diam. 28·75, min. 21·25: alt. axis 6·5 millim.

Operculum shelly in front, multispiral, having the appearance of a strand of rope coiled on itself, thin, flat, and horny on the inner side.

Hab. Molu Hills (*R. Hungerford*).

31. CYCLOTUS TRUSANENSIS, n. sp. (Plate XXXVI. figs. 5, 5*a*.)

Shell discoid, very widely umbilicated; all the whorls showing; sculpture a thick epidermis, with lines of growth; colour dark umber-brown, with a few small splashings of ochre; spire flatly depressed; apex scarcely rising above the last whorl; suture impressed; whorls 5, rounded, the last slightly descending; aperture circular, oblique; peristome double, inner simple, continuous, the outer slightly reflected, gradually expanding towards the margin, forming at the suture a small wing, which is attached to the penultimate whorl.

Size (of shell drawn): maj. diam. 18·5, min. 15·0; alt. axis 4·5; diam. aperture 7·80 millim.

Size (largest in collection): maj. diam. 22·5, min. 17·5; alt. axis 5·0; diam. aperture 9·0 millim.

Operculum shelly in front, flatly concave, with a small central circular depression, horny at back, surface flat.

Hab. Trusan Island (*A. Everett*).

This shell without its operculum might on a casual examination be referred to *Pterocyclos tenuilabiatus*, Metcalfe; but it may be distinguished from this latter by its closer umbilication and by the last whorl not descending so rapidly. It is remarkable to find two shells so very similar, and yet showing so wide a difference in the form of the operculum.

Pterocyclos tenuilabiatus is quite plain in coloration, while *Cyclotus trusanensis* shows bands of pale zigzag markings.

2nd Group. *Cycloti marmorati.*

Shell more or less turbinate, narrowly umbilicate, smooth, with marbled or fine zigzag markings.

Cyclotus amboinensis, Pfr.

Cyclophorus amboinensis, Pfr. P. Z. S. 1852, p. 144.

Cyclotus amboinensis, von Martens, Preuss. Exped. Ost-Asien, p. 121, pl. ii. figs. 4, 5.

Hab. Borneo. In Cuming collection, Brit. Mus.

This locality is doubtful; von Martens gives it from the Moluccas only, Amboina, Buru, &c.

3rd Group. *Cycloti suturales.*

Turbinate shells, openly umbilicate, plain in coloration, the last whorl slightly separated from the antepenultimate. Peristome simple, not reflected at all.

Cyclotus ptychoraphe, v. Martens.

Cyclotus ptychoraphe, v. Martens, Monatsber. d. Berlin. Akad. 64, p. 117; Preuss. Exped. Ost-Asien, Die Landschnecken, p. 125, ii. fig. 11 (1867).

Hab. Singkawang, Borneo; rare (*v. Martens*).

32. CYCLOTUS LINITUS, n. sp. (Plate XXXVI. fig. 3.)

Shell globosely turbinate, rather openly umbilicated; sculpture first two apical whorls show distinct liration, 14 on the whorl, it nce is suddenly smooth and transversely striated; spire conic; ex papillate; suture deep; whorls 4, very rounded; aperture cular, subvertical; peristome simple, not thickened.

Size: maj. diam. 7·25; alt. axis 3·5 millim.

Operculum shelly in front, multispiral.

Hab. Busan Hills (*A. Everett*).

There are a large number of specimens in the collection, all vered with a black substance completely concealing the form of shell; a state so often seen in certain species of *Alycæus*, and as I ve observed in those that have a burrowing habit. In this *Cyclotus* shells are more completely coated than usual. The drawing is m one cleaned after a soaking in warm water.

4th Group. *Cycloti liratuli.*

Shell turbinate, with high spire, with spiral ribbing; aperture ple, not reflected.

33. CYCLOTUS TRILIRATUS.

Cyclostoma triliratum, Mart. u. Chem. Conch.-Cab. ed. ii. p. 363, xlvii. figs. 8–10.

Cyclophorus triliratus, Reeve, Conch. Icon. pl. xix. fig. 96 (1861).

Cyclostoma quadrifilosum, Benson, Ann. & Mag. Nat. Hist. ser. 2, p. 270 (1852).

In Dr. Hungerford's collection.

Cyclotus angulatus, v. Martens.

Cyclotus angulatus, v. Martens, Jahrb. d. deutsch. Malakozool. sell. 1874, p. 56.

JERDONIA, Blanf.

34. JERDONIA? BORNEENSIS, n. sp. (Plate XXXVI. figs. 6, 6 *a*.)

Shell dextral, pyramidal, turreted, strongly lirate, openly umbilied; sculpture 5 strong longitudinal ribs on the whorl, the two ow and the three above separated by a wider interval; two strong sely placed longitudinal ribs run with the angulate margin of the bilicus, and one fine rib within it; colour pale greenish horny; re high; apex rather pointed; suture angulately open; whorls 6, gularly convex; aperture oval, oblique, not double; peristome ple, with a marked sinuation or shallow notch on the lower rgin; columellar margin rounded and slightly thickened.

Size: maj. diam. 2·7; alt. axis 2·3 millim.

Operculum horny, multispiral, black-brown, with a pale centre, with a central minute hollow showing dark upon it, like the bull's eye of a target.

Hab. Busan Hills (*A. Everett*).

I place this species in the genus *Jerdonia* with doubt, the operculum of the S. Indian shell *J. trochlea* being of a decidedly calcareous nature; but unless the animal differs in other respects, it is not desirable to create a new genus only on the single character of the operculum.

ALYCÆUS, Gray.

Alycæus hochstetteri, Pfr.

Alycæus hochstetteri, Pfr. Malak. Blätt. vii. p. 215, pl. iii. fig. 14 (1860).

35. ALYCÆUS SPIRACELLUM, Adams & Reeve. (Plate XXXVII. figs. 6, 6 *a*.)

Cyclostoma spiracellum, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 56, pl. xiv. fig. 1 (1860).

This figure is not sufficiently good for the identification of the species, and I have therefore given an enlarged drawing taken from a typical specimen in the British Museum.

36. ALYCÆUS GALBANUS, n. sp. (Plate XXXVII. figs. 1, 1 *a*.)

Shell dextral, pyramidal, closely umbilicated, the last whorl slightly constricted and swelling again towards the aperture; sculpture very fine irregular transverse striation, a few stronger costulate striæ near the sutural tube, smooth in front of this; colour pale yellowish sap-green, dark on the apex; spire high, conic; apex sharp; suture moderately impressed; sutural tube only 0·7 millim. in length, blunt; whorls 6, rather flat-sided; aperture circular; peristome double, the outer much expanded on the upper outer margin and forming a sharp nick on the columellar side; columellar margin rounded.

Size: maj. diam. 6·0; alt. axis 4·75 millim.

Hab. Niah Hills (*A. Everett*).

There are not many specimens of this pretty shell in the collection.

37. ALYCÆUS GLOBOSUS, H. Adams. (Plate XXXVII. figs. 3, 3 *a*.)

Alycæus globosus, H. Adams, P. Z. S. 1870, p. 794.

Hab. Busan, near Sarawak.

Shell dextral, globosely pyramidal, narrowly umbilicated; sculpture very fine regular costulation, quite smooth from sutural tube to the aperture; colour on apex pale orange, the rest very pale white with a slight green tinge; spire conical, somewhat depressed; apex blunt; suture well impressed; the sutural tube short and club-like; whorls 4, sides very convex, the last but very slightly constricted; aperture circular; peristome double, the outer lip much expanded on the columellar margin, covering the umbilicus.

Size: maj. diam. 3·0; alt. axis 2·90 millim.

Hab. Sarawak proper and Busan Hills.

This is the Bornean representative of the Indian *Alycæus gra-icus* and *A. otiphorus*; there is a large series in the collection.
I am informed by Mr. Edgar Smith that although the British useum purchased all the types in Mr. Henry Adams's collection, is shell was not among them, and that the type is probably lost.

38. Alycæus hosei, n. sp. (Plate XXXVII. fig. 2.)

Shell dextral, tubinately pyramidal, narrowly umbilicated; sculp-re very fine close regular costulation, slightly better defined at the tural tube, quite smooth thence to the aperture; colour very pale th a slight tint of sea-green; spire high; apex pointed; suture ll impressed, the sutural tube fine and short; whorls 5½, sides nvex, the last with a slight contraction in front of the sutural be; aperture circular; peristome sharply edged, the outer lip ing much expanded and rising on the last whole but one and ntracting again on the inner margin; columellar margin circular.
Size: maj. diam. 5·75; alt. axis 6·25 millim.
Hab. Busan Hills (*A. Everett*).

39. Alycæus everetti, n. sp. (Plate XXXVII. figs. 5, 5 *a*.)

Shell dextral, not depressedly tubinate, widely umbilicated; sculp-re quite smooth above, close costulation at sutural tube, gradually creasing to a few distant very minute striæ, fine close costula-n within the umbilicus; colour whitish, apex pinkish brown; ire subconic; apex papillate; suture deep, the sutural tube 1·5 illim. in length, well developed; whorls 4, sides convex, the last ghtly constricted near sutural tube, then swelling and descending wards the aperture; aperture oblique ovate, angulate above at inner per margin of the peristome; peristome double, the outer expanded ghtly and to its greatest extent on lower inner margin; columellar rgin rounded.
Size: maj. diam. 5·0; alt. axis 2·5 millim.
Hab. Niah Hills (*A. Everett*).
Only one specimen of this species was found.

40. Alycæus specus, n. sp. (Plate XXXVII. figs. 4, 4 *a*.)

Shell dextral, globosely conical, narrowly umbilicated; sculpture e rather distant ribbing, stronger at sutural tube and more distant terior to it; colour bleached; spire conic; sides flat; apex blunt; ture impressed, the sutural tube moderately long, stout; whorls 4, unded; aperture circular, angulate above near suture; peristome uble, outer expanded; columellar margin rounded.
Size: maj. diam. 3·25; alt. axis 1·75 millim.
Hab. In limestone caves at Jambusan (*A. Everett*).
I found four examples of this small species when looking over the ve-earth sent home by Mr. Everett; it has not yet been found ing, but is doubtless abundant in suitable localities.

DIPLOMMATINA, Benson.

41. DIPLOMMATINA CONCINNA, H. Adams.

Diplommatina concinna, H. Adams, P. Z. S. 1872, fig. 22.

This figure, though small, is, from the very peculia form of the shell, sufficient for its identification, and I h not given an enlarged drawing.

42. DIPLOMMATINA RUBICUNDA, v. Martens.

Paxillus rubicundus, v. Martens, Monatsber. d. B 1864, p. 119; Preuss. Exp. Ost-Asien, Die Landschne pl. iv. fig. 17 (1867).

Hab. Benkajang and Singkawang.

43. DIPLOMMATINA ADVERSA, H. & A. Ad. (Plat fig. 3.)

Paxillus adversus, H. & A. Adams, Ann. & Mag. ser. 2, vii. p. 63 (1851).

No figure having ever been given of this species, I n from a specimen received from Mr. Henry Adams som and in my collection.

44. DIPLOMMATINA BECCARII, Issel.

Paxillus beccarii, Issel, Moll. Born. Ann. Mus. Civ. p. 441, pl. vi. figs. 20–22 (1874).

45. DIPLOMMATINA ISSELI, n. sp. (Plate XXX 5, 5 *a*.)

Shell sinistral, elongately fusiform, slightly rimate; very fine spiral lination, crossed by well-defined regula close costulation; colour sienna-brown; spire high, taperi apex fine; suture well impressed; whorls 8, sides conv the largest, not ascending, constriction (fig. 5 *a*) on side behind aperture, where position of operculum may be see very oblique, oval; peristome double, not thickene slightly, with a thin callous on the last whorl; colume with a blunt rounded tooth.

Size: maj. diam. 2·9; alt. axis 4·0 millim.

Hab. Sarawak proper and Busan Hills (*A. Everett*).

The species occurred also among the shells from deposits.

This is a very peculiar form, and much more worthy of distinction than *Paxillus*, which is only a reversed *Diplo*

46. DIPLOMMATINA BUSANENSIS, n. sp. (Plate XXX

Shell sinistral, ovately fusiform, somewhat short; scu longitudinal striation, crossed by distant regular well-marke tion; colour orange-brown, dark madder-brown on ap turreted; apex pointed; suture deep; whorls 6, sides ve

ltimate ample, the antepenultimate the largest; aperture ovate, ertical; peristome double, continuous, rounded on the outer gin, angular on the columellar side; columellar margin oblique ards, tooth small and blunt.

ze: maj. diam. 2·0; alt. axis 3·4 millim.

ab. Busan Hills (*A. Everett*).

nly two specimens found in the collection. It belongs to the p of sinistral *Diplommatina* (*Palaina*).

. Diplommatina niahensis, n. sp. (Plate XXXVIII. figs. *a*.)

hell dextral, ovate, fusiform, solidly built; sculpture smooth, fine costulation on the 4 apical whorls, but showing fine, nt and indistinct on the penultimate and body-whorl; colour amber, very ruddy at the apex; spire attenuate, sides flat; sharp; suture well marked; whorls 8, rapidly increasing the fifth, antepenultimate the largest, the last rising near the ture on the penultimate whorl, the constriction being on this just behind the aperture on right side; aperture large and dly ovate, perpendicular; peristome double, much thickened developed, sharply angulate below and at the upper outer margin, h is sinuate as viewed from the right side; columellar tooth large and strong, the margin perpendicular.

ze: maj. diam. 2·7; alt. axis 4·4 millim.

ab. Niah Hills (*A. Everett*).

his is a very beautiful species of this genus and of a very remark- form, altogether different from any with which I am acquainted.

. Diplommatina spinosa, n. sp. (Plate XXXVIII. fig. 1.)

hell dextral, elongately turreted; sculpture worn off; colour pletely faded; spire high, attenuate; apex pointed; suture crate; whorls 9, the penultimate and antepenultimate equal, last nding, rounded above, slightly angulate below, where in the per- shell numerous spines were developed, the circular bases showing re they once projected; aperture broadly ovate, suboblique; stome double; outer lip rises halfway up the penultimate whorl, ring it in front; columellar margin straight, with well-developed t tooth.

ze: maj. diam. 2·9; alt. axis 6·0; diam. ap. 2·4 millim.

ab. Cave exploration A (*A. Everett*).

his species has not yet been found living, and when it has it be an interesting discovery, more particularly to see what the of its spine is; but, judging from what we now know of those ornament *Opisthostoma grandi-spinosum*, they are probably lar and curved and trough-like; the perfect shell must be a ly form.

. Diplommatina rubra, n. sp. (Plate XXXVIII. fig. 7.)

hell sinistral, rimate, fusiform, elongate, turreted; sculpture ite, close, slightly raised transverse costulation; colour rich

ruddy amber; spire high, sides slightly convex; apex jointed; suture moderately impressed; whorls 7, sides flat on apical, convex below, the last rising on the penultimate, antepenultimate the largest; aperture broadly oval, suboblique; peristome double, the outer thin and expanded; columellar tooth small.

Size: maj. diam. 3·3; alt. axis 6·4 millim.

Hab. Niah Hills (*A. Everett*).

Five specimens occurred in the collection. This is a finely developed species and one of the largest from Borneo.

Opisthostoma, Blyth.

50. Opisthostoma grandi-spinosum, n. sp. (Plate XXXVIII. figs. 2, 2 *a*.)

Shell dextral, depressedly pyramidal, thin, glassy, transparent; sculpture smooth, with lines of growth; the periphery, the upper whorls, and the extended free portion of the last whorl are set with curved, white, glassy spines, the largest nearest to the aperture; each spine rises from a fine transverse rib, above and below the whorl, these nearly meeting, a gutter-like fold is produced which rises at right angles with the whorl; colour pale amber or sienna-brown, with a golden lustre; spire moderately high, conic, sides convex; apex rather sharp; suture impressed; whorls 5 to the constriction, whence it leaves the adjacent whorl, and turns sharply at right angles upwards in a diagonal direction to the apex of the shell, lying closely to the spire, reaching the apex it takes another sharp turn to the aperture, which thus rises high above and clear of the apex; aperture widely circular, trumpet-shaped; peristome continuous, thin, simple.

Size: maj. diam. 2·4; alt. axis 1·9; length of longest spine 1 millim.

Hab. Niah Hills (*A. Everett*).

This is certainly the most beautiful form of a very beautiful and minute genus of land-shells, the finest thing that has been discovered for a long time. It is almost impossible to describe the delicate structure of the spines that cover it, rising from the golden-coloured whorls.

51. Opisthostoma decrespignyi, H. Adams.

Plectostoma decrespignyi, H. Adams, Ann. & Mag. Nat. Hist. ser. 3, xv. p. 177 (1865); Issel, Moll. Born. Ann. Mus. Civ. Genova, vi. p. 439, pl. vi. figs. 13, 15 (1874).

Raphaulus, Pfeiff.

52. Raphaulus bombycinus, Pfr.

Anaulus bombycinus, Pfr. P. Z. S. 1855, p. 105, pl. xxxii. fig. 10, male; id. Novit. Conch. i. pl. xvii. figs. 12, 13; H. & A. Adams, Gen. Moll. ii. p. 286, pl. lxxxiii. fig. 3 (1858).

Hab. Limestone caves (*A. Everett*).

3. Raphaulus pfeifferi, Issel.

Raphaulus pfeifferi, Issel, Moll. Born. Ann. Mus. Civ. Genova, vi. 143, pl. vii. figs. 4–6 (1874).

Hab. In cave-earth (*A. Everett*).

One specimen only.

Pupina, Vign.

4. Pupina doriæ, n. sp. (Plate XXXIX. figs. 2, 2 *a*, 2 *b*.)

Shell ovately globose, solid, glassy; sculpture microscopic transverse striæ; colour pearly white; spire moderately high, sides rounded; apex very blunt; suture linear; whorls 4½, flatly convex; aperture circular, vertical; peristome solid, sinuate on upper outer margin, when viewed from the side, with a slot at the suture; the columellar margin broad, cut off from the peristome by a well-marked callus.

Size: maj. diam. 2·7; alt. axis 4·3 millim.

Hab. Busan Hills (*A. Everett*).

Only one specimen of this very distinct species was found. It is noticeable for its small size and white colour. I have named it after Signor Doria.

5. Pupina hosei, n. sp. (Plate XXXIX. figs. 1, 1 *a*.)

Shell globosely oval, solid, glassy, transparent; sculpture a slight indication of transverse striation under the glassy surface; colour burnt-sienna; spire moderately high; apex blunt; suture very shallow; whorls 5½, sides rather flat; the last somewhat swollen; aperture circular, perpendicular; peristome indistinctly double, very thickened, as well as the columellar margin, this is double, cut off from the peristome by a deep notch; another deep notch near parietal margin.

Size: maj. diam. 3·0; alt. axis 6·9 millim.

Hab. Busan Hills (*A. Everett*).

The collection only contains four specimens of this species, but in good preservation. It also occurred in the cave explorations made by Mr. Everett.

6. Pupina evansi, n. sp. (Plate XXXIX. figs. 3, 3 *a*.)

Shell globosely oval, polished, solid; sculpture very minute, transverse, distant striation, probably more marked in the living state; colour quite faded, a slight tinge of brown remaining, so that it was probably of a bright polished brown; spire high, sides convex; apex blunt; suture very shallow; whorls 5, sides convex; aperture circular, perpendicular; peristome thickened, discontinuous, sinuate on margin, a very narrow slot at the columellar margin, another near suture.

Size: maj. diam. 4·2; alt. axis 6·6 millim.

Hab. From deposit in Cave A (*A. Everett*).

Only two specimens were found by me in the cave-earth; it is quite distinct from the two other Pupinas discovered by Mr. Everett.

I have much pleasure in naming it after Mr. John Evans, who did so much to promote the exploration of the Bornean caverns.

PUPINELLA, Gray.

Pupinella borneensis, Pfr.

Pupinella borneensis, Pfr. P. Z. S. 1861, p. 389, pl. xxxvii. fig. 1.

MEGALOMASTOMA, Guilding.

Megalomastoma doriæ, Issel.

Megalomastoma doriæ, Issel, Moll. Born. Ann. Mus. Civ. Genova, vi. p. 430, pl. vi. figs. 18, 19 (1874).

Hab. Sarawak (*Doria and Beccari*). Five examples.

57. MEGALOMASTOMA ANOSTOMA, Benson.

Cyclostoma anostoma, Benson, Ann. & Mag. Nat. Hist. ser. 2, x. p. 269 (1852).

Megalomastoma anostoma, Issel, Moll. Born. Ann. Mus. Civ. Genova, vi. p. 429, pl. vi. figs. 16, 17 (1874).

Cyclostoma sectilabrum, Mart. u. Chemn. Conch.-Cab. ed. ii. p. 377, pl. xlvii. figs. 11, 12.

Cyclostoma leferi, Morelet, Journ. de Conch. 1861, p. 176.

Megalomastoma lowei, Sowerby, Thesaur. Conch. iii. pl. cclxiii. fig. 1.

Hab. Trusan and Niah Hills (*Everett*).

HELICINA, Lamarck.

58. HELICINA USUKANENSIS, n. sp. (Plate XXXIX. fig. 7.)

Shell dextral, lenticular, solid, convex below; sculpture nearly smooth, fine lines of growth, crossed by irregular diagonal striation; colour pale ruddy madder-brown, pale straw-colour below and on periphery, an indistinct band seen inside the aperture; spire depressedly pyramidal, sides flatly convex; apex blunt; suture linear; whorls 4, regularly increasing, sides very flat, the last bluntly carinate, with an obsolete band below; aperture acute, white, slightly reflected; columellar margin short, thickened, the callous short and semicircular.

Size: maj. diam. 7·10; alt. axis 3·75 millim.

Hab. Usukan Island, Borneo (*A. Everett*).

This species approaches very near to *H. martensi* in form of the columellar margin, but differs in colour and the form of the carinate periphery, as also in its flatter-sided spire.

Helicina borneensis, v. Martens.

Helicina borneensis, v. Martens, Monatsber. d. Berlin. Akad. 1864, p. 120; Reeve, Conch. Icon. pl. xxx. fig. 267 (1873).

Hab. Singkawang (*v. Martens*).

Helicina crossei, Semper.

Hab. Palawan. In Brit. Mus.

Helicina martensi, Issel.

Helicina citrina? (Pfr.), var., v. Martens, Malak. Blätt. 1873, 61.

Helicina martensi, Issel, Moll. Born. Ann. Mus. Civ. Genova, p. 444, pl. vi. figs. 23–25 (1874).

Georissa, Blanf.

9. Georissa hosei, n. sp. (Plate XXXIX. fig. 11.)

Shell elongately conoid, rather solid, imperforate; sculpture ill-ned spiral lination; colour ruddy ochraceous; spire high; apex nt; suture impressed; whorls 4, sides flat, angulate above and ow on the periphery, the median side of each whorl being parallel h the axis of the shell, more rounded on the last whorl; aperture l, oblique; peristome simple, somewhat thickened above; colu-llar margin straight.

Size: maj. diam. 1·5; alt. axis 1·9 millim.

Hab. Borneo (*C. Hose*, 1889). In Brit. Mus. collection.

The square form of the second whorl is peculiar, and distinguishes rom the other Bornean species. Only two specimens are in the ection. The exact locality I have not yet ascertained; it urred among a small collection of shells sent to the British Mu-m by Mr. Hose in May 1889, which Mr. Edgar Smith has kindly me figure and describe.

50. Georissa williamsi, n. sp. (Plate XXXIX. fig. 10.)

Shell elongately ovate, solid; sculpture indistinct spiral lination, owing strongest on the apical whorl; colour ruddy ochraceous; re high; apex blunt, smooth; suture well impressed; whorls $4\frac{1}{2}$, vex, the last very ample; aperture oval, oblique; peristome ple, sharp-edged; columellar margin straight.

Size: maj. diam. 1·7; alt. axis 2·30 millim.

Hab. Borneo (*C. Hose*). In Brit. Mus. collection.

Only one example occurred among four specimens of *Georissæ* t by Mr. Hose to the British Museum, one being *G. niahensis*, d two others of a new species and very distinct form, which I have ned *G. hosei*. I have named this species after Dr. Williams, who ved with Rajah Brooke on the first occupation of the country.

51. Georissa niahensis, n. sp. (Plate XXXIX. fig. 8.)

Shell elongately conoid, solid, imperforate; sculpture a very in-tinct, ill-defined spiral lination, about 20 on the penultimate whorl, on a rough surface crossed by transverse lines of growth; colour ddy ochre; spire high; apex pointed, finely papillate, minutely ate; suture impressed; whorls $4\frac{1}{2}$, convex; aperture oval, lique; peristome simple, acute below; columellar margin aight.

Size: maj. diam. 2·3; alt. axis 3·6 millim.

Hab. Niah Hills (*A. Everett*).

This is a large species of this genus, and its sculpture i
able character, from the lirate ribbing being so wanting in
definition it gen rally presents in other species.

62. Georissa hungerfordi, n. sp. (Plate XXXIX

Shell globosely conical, solid, imperforate; sculpture spi
about 15 ribs on the last whorl, all sharply defined, but
ill-defined towards the apex, which is quite smooth; spir
apex papillate; suture well impressed; whorls 4, ver
aperture semi-ovate, subvertical; peristome simple, out
rounded, straight on the columellar side.

Size: maj. diam. 1·2; alt. axis 1·38 millim.

Hab. Borneo (*Sir H. Low*). In collection of Dr. Hun

Truncatella, Risso.

63. Truncatella marginata, Küster.

Truncatella marginata, Mart. u. Chemn. Conch.-Cab. e
figs. 24–26 (1855).

64. Truncatella aurantia, Gould.

Truncatella aurantia, Gould, Exped. Shells, p. 39.

Hab. Maugsi, near Borneo.

Hydrocena, Parreyss.

65. *Hydrocena cornea*, Pfr.

Hydrocena cornea, Pfr. P. Z. S. 1854, p. 306.

Not *Assiminea* (*Optediceros*) *cornea*, Leith, Journ. Bo
R. As. Soc. v. p. 145 (1853).

Omphalotropsis, Pfr.

66. *Omphalotropsis glabrata*, Pfr.

Hydrocena (*Omphalotropsis*) *glabrata*, Pfr. P. Z. S. 18
Hab. Borneo (*Pfr.*).

67. *Omphalotropsis radiata*, Pfr.

Hydrocena (*Omphalotropsis*) *radiata*, Pfr. P. Z. S. 185
Hab. Borneo (*Pfr.*).

68. *Omphalotropsis carinata*, Lea.

Assiminea carinata, Lea, Proc. Acad. Nat. Sci. Philad.
(1857); Ann. Mus. Civ. Genova, p. 447, pl. vii. figs. 7–
Hab. Siam (*Lea*); Borneo (*Geale, coll. Mousson*).

Subgenus Optediceros, Blanford.

69. *Omphalotropsis paladilhi*, Issel.

Omphalotropsis paladilhi, Issel, Moll. Born. Ann.
Genova, vi. p. 448, pl. vii. figs. 10–12 (1874).

Hab. Sarawak (*Doria and Beccari*).

70. Omphalotropsis bankaensis, Mousson.

Hab. Borneo. In collection of Dr. Hungerford.

EXPLANATION OF THE PLATES.

Plate XXXV.

Figs. 1, 1*a*, 1*b*. *Cyclophorus niahensis*, n. sp., nat. size, p. 334.
2, 2*a*. *Pterocyclos cucullus*, n. sp., × 2·5 and 1·65, p. 340.
3, 3*a*. —— *niahensis*, n. sp., × 2·5, p. 340.
4, 4*a*. —— *tenuilabiatus*, × 2·5 and 1·65, p. 339.
5, 5*a*, 5*b*. *Opisthoporus pterocycloides*, × 2·5 and 1·65, p. 341.

Plate XXXVI.

Figs. 1, 1*a*. *Rhiostoma cavernæ*, n. sp., × 2·5, p. 342.
2, 2*a*. —— *gwendolenæ*, n. sp., × 2·5, p. 342.
3. *Cyclotus limitus*, n. sp., × 4, p. 345.
4. —— *boxalli*, n. sp., nat. size, p. 343.
4*a*. —— ——, aperture, × 2·5, p. 343.
5, 5*a*. —— *trusanensis*, n. sp., × 2·5, p. 344.
6, 6*a*. *Jerdonia? borneensis*, n. sp., p. 345.

Plate XXXVII.

Figs. 1, 1*a*. *Alycæus galbanus*, n. sp., × 4, p. 346.
2. —— *hosei*, n. sp., × 4, p. 347.
3, 3*a*. —— *globosus*, H. Adams, × 7 and 12, p. 346.
4, 4*a*. —— *specus*, n. sp., × 7, p. 347.
5, 5*a*. —— *everetti*, n. sp., × 4, p. 347.
6, 6*a*. —— *spiracellum*, Adams and Reeve, × 7, p. 346.

Plate XXXVIII.

Figs. 1. *Diplommatina spinosa*, n. sp., × 7, p. 349.
2, 2*a*. *Opisthostoma grandi-spinosum*, n. sp., × 12, p. 350.
3. *Diplommatina adversa*, × 7, p. 348.
4. —— *busanensis*, n. sp., × 7, p. 348.
5, 5*a*. —— *isseli*, n. sp., × 7, p. 348.
6, 6*a*. —— *niahensis*, n. sp., × 7, p. 349.
7. —— *rubra*, n. sp., × 7, p. 349.

Plate XXXIX.

Figs. 1, 1*a*. *Pupina hosei*, n. sp., × 4, p. 351.
2, 2*b*. —— *doriæ*, n. sp., × 7, p. 351.
2*a*. —— ——, n. sp., × 4, p. 351.
3, 3*a*, —— *evansi*, n. sp., p. 351.
4. *Lagocheilus keppeli*, n. sp., × 2·5, p. 338.
5. —— *dido*, n. sp., × 2·5, p. 338.
6, 6*a*. —— *mundyanus*, n. sp., × 4; aperture, × 7, p. 338.
6*b*. —— ——, operculum, × 12, p. 338.
7. *Helicina usukunensis*, n. sp., × 7, p. 352.
8. *Georissa niahensis*, n. sp., × 7, p. 353.
9. —— *hungerfordi*, n. sp., × 12, p. 354.
10. —— *williamsi*, n. sp., × 12, p. 353.
11. —— *hosei*, n. sp., × 12, p. 353.

3. On the Birds collected by Mr. H. C. V. Hunter, in Eastern Africa. By Captain G. E. Shelley, F

[Received June 6, 1889.]

(Plates XL. & XLI.)

Mr. Hunter, during a sporting-tour in Eastern Africa, the slopes of Kilimanjaro mountain and made a fine collection in that district during the months of June, July, and Augu year.

This collection he has presented to the British Museum through the kindness of Dr. Günther, I have been enabled to the contents. It consists of examples of 95 species, of whic described seven as new:—*Pachyprora mixta*, *Xenocichla* *Xenocichla placida*, *Alcippe kilimensis*, *Cisticola hunteri*, *hunteri*, and *Zosterops perspicillata*.

Besides these, amongst many other rarities the British acquires the second known specimens of *Hapalolerma vitt* *Pinarochroa hypospodia*, and adds to its stores examples of *orientalis*, *Nectarinia melanogastra*, and of the fully adult *Pholidauges fischeri*, of which the female only was known.

1. Bubo lacteus.

Bubo lacteus (Temm.), Sharpe, Cat. B. Brit. Mus. ii. p. 33 Fisch. & Rchw. J. f. O. 1879, p. 340; Böhm, J. f. O. 1882 Schal. J. f. O. 1883, p. 345; Fisch. J. f. O. 1885, p. 122 Zool. Jahrb. i. p. 307 (1887).

Useri river, August.

2. Campothera nubica.

Picus nubicus, Gm., Shelley, P. Z. S. 1881, p. 593; Böhm 1883, p. 168.

Campothera nubica, Hargitt, Ibis, 1883, p. 451; Fisch. 1885, p. 126; Rchw. J. f. O. 1887, p. 90; Matsch, *t. c.* Shelley, P. Z. S. 1888, p. 41; id. Ibis, 1888, p. 296.

Useri river, July.

3. Indicator major.

Indicator major, Steph., Sharpe, P. Z. S. 1873, p. 71 Dawson Rowley's Orn. Miscell. i. p. 264; Cab. J. f. O. 1878 Böhm, J. f. O. 1885, p. 57; Fisch. *t. c.* p. 124; Hartl. Zool. p. 311.

♂. Teita, August 29.

4. Pogonorhynchus melanopterus.

Pogonorhynchus melanopterus (Peters), Shelley, P. Z. p. 592; Fisch. Zeitschr. ges. Orn. 1884, p. 370; id. J. f. O p. 125; Shelley, Ibis, 1888, p. 291.

Teita, June.

POGONORHYNCHUS STIGMATOTHORAX.

cholæma stigmatothorax, Cab. J. f .O. 1878, p. 240; Fisch. hr. ges. Orn. 1884, p. 371; id. J. f. O. 1885, p. 125.
Useri river, July 3.

BARBATULA LEUCOTIS.

galæma leucotis (Sundev.), Fisch. Zeitschr. ges. Orn. 1884, ; id. J. f. O. 1885, p. 125.
batula leucotis (Sundev.), Marshall, Monogr. Cap. p. 131, (1871); Shelley, P. Z. S. 1885, p. 223.
imanjaro.

BARBATULA AFFINIS.

batula affinis, Rchw. Orn. Centralbl. 1879, p. 114; Rchw. O. 1879, p. 314; Fisch. Zeitschr. ges. Orn. 1884, p. 371; f. O. 1885, p. 124; Rchw. J. f. O. 1887, p. 59.
Teita, August. Useri river, July.

TRACHYPHONUS ERYTHROCEPHALUS.

chyphonus erythrocephalus, Cab. J. f. O. 1878, pp. 218, 240, figs. 1, 2; Hartl. Ibis, 1886, p. 111; Shelley, Ibis, 1888, .
eta. Also seen on Kilimanjaro.

TRACHYPHONUS BOEHMI.

chyphonus arnaudi, Cab. J. f. O. 1878, p. 240.
chyphonus squamiceps (nec Heugl.), Fisch. & Rchw. J. f. O. p. 342.
chyphonus margaritatus (nec Rüpp.), Schal. J. f. O. 1883, 6.
chyphonus boehmi, Fisch. & Rchw. J. f. O. 1884, p. 179; . Zeitschr. ges. Orn. 1884, p. 371; id. J. f. O. 1885, p. 125; . Ibis, 1886, p. 109.
Ndara in Teita, August 25.
♀. Useri river, July 3.

CERYLE MAXIMA.

ryle maxima (Pall.), Sharpe, Monogr. Alced. p. 67, pl. 20); Böhm, J. f. O. 1885, p. 47; Fisch. *t. c.* p. 126; Matsch. O. 1887, p. 151; Schal. *t. c.* p. 236; Shelley, Ibis, 1888, 1.
eta.

HALCYON CHELICUTENSIS.

lcyon chelicutensis (Stanley), Shelley, P. Z. S. 1881, p. 567; , J. f. O. 1883, p. 172; Fisch. J. f. O. 1885, p. 126; Rchw. O. 1887, p. 60; Matsch. *t. c.* p. 151; Shelley, Ibis, 1888, 7.
Useri river, on side of Kilimanjaro, July 6.

12. Irrisor cyanomelas.

Rhinopomastes cyanomelas (Vieill.), Shelley, P. Z. S. 1881, p. 570; Schal. J. f. O. 1883, p. 351.

Irrisor cyanomelas, Böhm, J. f. O. 1883, p. 190; Fisch. J. f. O. 1885, p. 127; Shelley, Ibis, 1888, p. 297.

♂ ♀. Duruma, August 29.

13. Irrisor minor.

Promerops minor, Rüpp. Syst. Uebers. p. 25 (1845).

Epimachus minor, Rüpp. *t. c.* pl. 8.

Taveta.

14. Melittophagus cyanostictus.

Melittophagus pusillus, Shelley, P. Z. S. 1881, p. 569; Tristr. Ibis, 1889, p. 225.

Merops pusillus, Gurney, Ibis, 1882, p. 72.

Merops cyanostictus, Cab., Böhm, J. f. O. 1883, p. 175; 1885, p. 47.

Melittophagus cyanostictus, Fisch. J. f. O. 1885, p. 127; Cab. *t. c.* p. 340; Rchw. J. f. O. 1887, p. 61; Matsch. *t. c.* p. 151; Shelley, Ibis, 1888, p. 296.

♂ ad. et juv. Ndara in Teita.

15. Coracias caudata.

Coracias caudata, Linn., Shelley, P. Z. S. 1881, p. 566; Böhm, J. f. O. 1883, p. 173; Schal. *t. c.* p. 348; Böhm, J. f. O. 1885, p. 57; Matsch. J. f. O. 1887, p. 152; Schal. *t. c.* p. 236; Tristr. Ibis, 1889, p. 225.

♂ ♀. Useri river, July 1.

16. Turacus hartlaubi.

Corythaix hartlaubi, Fisch. & Rchw. J. f. O. 1884, p. 52; Fisch. J. f. O. 1885, p. 123; Schal. J. f. O. 1886, p. 39; Rchw. J. f. O. 1887, p. 57.

Turacus hartlaubi, Shelley, P. Z. S. 1884, p. 224.

♂ ♀. Kilimanjaro, 6000 ft., August 6.

17. Gallirex chlorochlamys.

Gallirex chlorochlamys, Shelley, P. Z. S. 1881, p. 590; Fisch. J. f. O. 1885, p. 123; Schal. J. f. O. 1886, p. 52.

Corythaix porphyreolophus, Böhm, J. f. O. 1882, p. 208.

♂. Duruma, August 29.

18. Colius leucotis.

Colius leucotis, Rüpp., Shelley, P. Z. S. 1881, p. 590, 1885, p. 224; Fisch. J. f. O. 1885, p. 123; Rchw. J. f. O. 1887, p. 57; Matsch. *t. c.* pp. 140, 149, 159.

♂. Ndara in Teita, August 25.

♂. Kilimanjaro, August 8.

HAPALODERMA VITTATUM.

aloderma vittatum, Shelley, P. Z. S. 1882, p. 306.
est on Kilimanjaro, 6000 ft. Also seen in Kahé forest.

CYPSELUS MELBA.

selus melba (Linn.), Dresser, B. Eur. iv. p. 603, pl. 269.
Kilimanjaro, 5000 ft., August 4.

CYPSELUS HORUS.

selus horus, Hartl. & Finsch; Salvadori, Ibis, 1881, p. 541.
selus sharpii, Bouvier, Bull. Soc. Zool. France, i. p. 228, pl. 6.
1876); Sharpe, P. Z. S. 1882, p. 688.
Useri river, July 18.
comparing this specimen with *C. caffer* and *C. affinis*, I find it
er strongly in having the throat whiter and the tail inter-
e in length.

PSALIDOPROCNE PETITI.

idoprocne petiti, Sharpe & Bouvier, Bull. Soc. Zool. France,
3, pl. 2.
Taveta, August 15.
ve compared this specimen with seven others from Landana
agrees perfectly. *P. antinorii* is probably identical, as the
of the under wing-coverts varies.

CAMPOPHAGA NIGRA.

pophaga nigra, Vieill.; Shelley, P. Z. S. 1881, p. 578; Böhm,
. 1883, p. 181; Schal. *t. c.* p. 354; Fisch. Zeitschr. ges.
884, p. 356; id. J. f. O. 1884, p. 128; Böhm, J. f. O. 1885,

. Taveta, August 18.
Teita, August 25.

PACHYPRORA MIXTA, n. sp. (Plate XL.)

t male. Very similar to *P. molitor*, from which it differs in
scarcely a trace of white on the sides of the forehead; one
of the feathers above the ear-coverts are mottled with whitish;
ite nuchal spot very slightly marked; posterior half of the
rs uniform grey like the crown and back; lower back and
ail-coverts also uniform grey, with no black and white mottling;
g, which is very similarly marked to that of *P. molitor*, has
te portion more contracted; tail black, with triangular white
all the feathers; the external web of the outer feather is
only edged with white, while in *P. molitor* the white crosses
. Beneath, throat, lower breast, and under tail-coverts white,
broad pectoral band and the thighs black as in *P. molitor*;
urface of the wings whiter than in *P. molitor*, the under
overts being white with the exception of the outer half of the
and median series, which are black. Bill black, legs slightly

browner. Total length 4 inches, culmen 0·5, wing 2·2, tail 1·6, tarsus 0·7.

Adult female. Differs greatly from *P. molitor*, and much resembles *P. capensis* in the colouring of the upper parts. Forehead, crown, and back of the neck grey; lores and sides of the head black, separated from the grey forehead and crown by a partially defined white stripe; mantle olive-shaded brown as in *P. capensis*; lower back partially mottled with white; wings dark brown, the least series washed with the same colour as the mantle; some of the median and greater coverts fawn-colour, forming a patch on the wing; margins of quills pale, passing into fawn-colour on the inner secondaries; tail black, the feathers edged with white and with white angular tips; the white on the outer tail-feather never extends across the outer web, as it always does in *P. molitor* and *P. capensis*. Underparts and sides of the neck white, strongly washed with fawn-colour, mostly towards the base of the feathers of the throat and sides of the chest; under surface of the quills dusky, with white inner margins; under wing-coverts white, with the outer half of the least and median series ashy shaded black. Bill black; legs browner. Total length 3·8 inches, culmen 0·5, wing 2·4, tail 1·5, tarsus 0·7.

Kilimanjaro, ♂ ♀, 7000 ft., 6000 ft., August.

I have no hesitation in referring these two specimens to the same species; their tails exactly agree and present a character by which they may with certainty be separated from both *P. molitor* and *P. capensis*, of both of which species they unite certain characteristics.

25. Muscicapa cærulescens.

Muscicapa cærulescens, Hartl., Sharpe, Cat. B. Brit. Mus. iv. p. 154 (1879).

Teita, August 26.

This specimen differs from six others with which I have compared it, in having the greater series of wing-coverts distinctly edged with white and broadly tipped with that colour, and the pale edges of the quills decidedly broader and whiter. Total length 4·95 inches, culmen 0·5, wing 2·9, tail 2·55, tarsus 0·6.

I prefer to regard the slight characters above enumerated as rather a sign of immaturity than of specific value.

26. Cryptolopha umbrovirens.

Cryptolopha umbrovirens (Rüpp.), Sharpe, Cat. B. Brit. Mus. iv. p. 401, pl. 12. fig. 2.

Kilimanjaro, 6000 ft., August 8.

27. Terpsiphone cristata.

Terpsiphone cristata (Gm.), Shelley, P. Z. S. 1881, p. 577; id. Ibis, 1888, p. 299.

Terpsiphone ferreti, Böhm, J. f. O. 1883, p. 170; Schal. *t. c.* p. 353; Fisch. Zeitschr. ges. Orn. 1884, p. 353; id. J. f. O. 1885, p. 129; Rchw. J. f. O. 1887, p. 63.

erpsiphone melanogastra, Böhm, J. f. O. 1883, p. 179; Matsch. O. 1887, p. 153.
. Teita, August 8.

. TARSIGER ORIENTALIS.

rsiger orientalis, Fisch. & Rchw. J. f. O. 1884, p. 57; Fisch. chr. ges. Orn. 1884, p. 306; id. J. f. O. 1885, p. 142.
. Kilimanjaro, 6000 ft., August.

. EUROCEPHALUS RUEPPELLI.

rocephalus rueppelli, Bp.; Sharpe, Cat. B. Brit. Mus. iii. p. 280 7); Shelley, P. Z. S. 1882, p. 307; Schal. J. f. O. 1883, p. 357; . Zeitsch. ges. Orn. 1884, p. 350; id. J. f. O. 1885, p. 130; r. J. f. O. 1887, p. 65; Tristr. Ibis, 1889, p. 226.
rocephalus anguitimens (nec Smith), Shelley, P. Z. S. 1881, 2; Böhm, J. f. O. 1883, p. 185.
eri river.

. PRIONOPS TALACOMA.

ionops talacoma, Smith; Sharpe, Cat. B. Brit. Mus. iii. p. 321; , J. f. O. 1883, p. 184; Schal. *t. c.* p. 355; Fisch. J. f. O. p. 130.
veta.

. TELEPHONUS SENEGALENSIS.

lephonus erythropterus, Shelley, P. Z. S. 1881, p. 579; Böhm, O. 1883, p. 186; Schal. *t. c.* p. 354; Fisch. J. f. O. 1885, 0; Matsch. J. f. O. 1887, p. 153; Schal. *t. c.* p. 238.
lephonus senegalensis (Linn.), Gadow, Cat. B. Brit. Mus. viii. 4 (1883).
Teita, August 26. ♀. Plains of Taveta, August 13.

. DRYOSCOPUS FUNEBRIS.

yoscopus funebris, Hartl., Gadow, Cat. B. Brit. Mus. viii. 3; Rchw. J. f. O. 1887, p. 63.
ynchastatus funebris, Böhm, J. f. O. 1883, p. 182; Schal. *t. c.* 5; Böhm, J. f. O. 1885, p. 44; Fisch. *t. c.* p. 130.
Useri river, June.

. DRYOSCOPUS ÆTHIOPICUS.

yoscopus æthiopicus (Gm.), Gadow, Cat. B. Brit. Mus. viii. 9; Fisch. Zeitschr. ges. Orn. 1884, p. 349; id. J. f. O. 1885, 0; Matsch. J. f. O. 1887, p. 153; Schal. *t. c.* p. 239; Hartl. Jahrb. ii. p. 320.
Kilimanjaro, 5000 ft., August 6.

. DRYOSCOPUS CUBLA.

oscopus cubla (Shaw), Shelley, P. Z. S. 1881, p. 580; Gadow, . Brit. Mus. viii. p. 148; Böhm, J. f. O. 1883, p. 181; Schal.

t. c. p. 355; Fisch. Zeitschr. ges. Orn. 1884, p. 349; id. J. f. O. 1885, p. 129; Shelley, P. Z. S. 1885, p. 225; Rchw. J. f. O. 1887, p. 63; Matsch. *t. c.* p. 153; Schal. *t. c.* p. 239; Shelley, Ibis, 1888, p. 292.

♂. Teita, June. ♀. Useri river, July 14.

35. LANIARIUS SULFUREIPECTUS.

Laniarius sulfureipectus (Less.), Shelley, P. Z. S. 1881, p. 580; Gadow, Cat. B. Brit. Mus. viii. p. 159; Rchw. J. f. O. 1887, p. 63; Matsch. *t. c.* p. 153; Shelley, P. Z. S. 1888, p. 25; id. Ibis, 1888, p. 301.

Chlorophoneus sulfureipectus, Böhm, J. f. O. 1883, p. 184; Fisch. Zeitschr. ges. Orn. 1884, p. 349; id. J. f. O. 1885, p. 130.

♂. Taveta, August 18.

36. LANIUS CAUDATUS.

Lanius caudatus, Cab.; Shelley, P. Z. S. 1881, p. 579; Gadow, Cat. B. Brit. Mus. viii. p. 254; Böhm, J. f. O. 1883, p. 187; Fisch. Zeitschr. ges. Orn. 1884, p. 344; Shelley, P. Z. S. 1885, p. 225; id. Ibis, 1888, p. 301.

Fiscus caudatus, Schal. J. f. O. 1883, p. 357; Fisch. J. f. O. 1885, p. 131.

Juv. Useri river.

37. XENOCICHLA NIGRICEPS, n. sp.

Adult male. General colour above yellowish olive, passing into dusky grey on the back of the neck and nape, and then into brownish black on the crown and forehead; eyes surrounded by a broadish band of ashy-white feathers; cheeks and ear-coverts dusky grey with paler centres; wing-coverts yellowish olive like the back; quills brown, strongly washed with yellowish olive on the outer webs; tail olive-brown washed with yellow, slightly browner than the back; chin, throat, and front half of the breast ashy grey; abdomen, flanks, and under tail-coverts rather bright olive-yellow; centre of the breast slightly washed with yellow; axillaries and under wing-coverts pale yellow, barely shaded with olive; under surface of the quills dusky black, their inner margins broadly edged with whitish yellow. Bill black; legs slaty grey. Total length 6·7 inches, culmen 0·65, wing 3·7, tail 3·3, tarsus 1·0.

Adult female. Similar in plumage to the male. Total length 7 inches, culmen 0·6, wing 3·5, tail 3·4, tarsus 0·9.

♂ ♀. Kilimanjaro, 6000 ft., August.

Compared with *X. tephrolæma*, this species has the bill rather shorter and the culmen slightly more curved; it resembles that species in size, colouring of the back, wings, and tail, and like it has the head and neck grey; but the crown in the present species is much darker, being nearly black. In *X. tephrolæma* the pale grey of the throat is of less extent, and the crop, entire body, and under tail-coverts are deep yellow shaded with olive.

38. Xenocichla placida, n. sp.

General colour above olive-brown, with a slight rufous shade on the crown and lower back; upper tail-coverts and tail rufous; wings dark brown, washed with rufous on the edges of all the feathers, the edges of the primaries being slightly paler and yellower; feathers in front of the eyes, lores and cheeks ashy; wing-coverts brown, all with pale buff ill-defined shaft-stripes; feathers surrounding the eye buff; chin, throat, and under surface of the body buff, washed with pale ashy olive across the crop and down the sides of the body; axillaries and under wing-coverts yellowish white; quills dark brown, with pale rufous-buff inner edges to the feathers, broadest towards their base. Upper mandible dark brown, with a pale cutting-edge; lower mandible paler and yellowish; legs slaty brown, claws pale brown. Total length 6·5 inches, culmen 0·6, wing 3, tail 3·2, tarsus 0·9.

Kilimanjaro, 6000 ft., August.

This species is nearly allied to *X. albigularis*, Sharpe, from Fantee, but is larger, has the bill shorter and the culmen more curved; the crown and back uniform, of a rather more rufous shade and not washed with grey on the crown; the wings more rufous, not edged with olive; tail similar. The underparts differ in the throat not being so white and the breast not being so strongly washed with bright yellow; the under surface of the wings much the same in both.

39. Pycnonotus layardi.

Pycnonotus layardi, Gurney, Shelley, P. Z. S. 1881, p. 576; Schal. J. f. O. 1883, p. 360; Fisch. Zeitschr. ges. Orn. 1884, p. 341; id. J. f. O. 1885, p. 137; Shelley, P. Z. S. 1885, p. 256; Rchw. J. f. O. 1887, p. 75.

♂. Teita, June.

40. Turdus tephronotus.

Turdus tephronotus, Cab., Shelley, P. Z. S. 1881, p. 574; Fisch. J. f. O. 1885, p. 141; Shelley, Ibis, 1888, p. 299.

♀. Useri river, July 1.

41. Cossypha caffra.

Cossypha caffra (Linn.), Sharpe, Cat. B. Brit. Mus. viii. p. 39 (1883).

♂. Kilimanjaro, August 5.

42. Bradyornis ater.

Bradyornis ater, Sundev., Sharpe, Cat. B. Brit. Mus. iii. p. 314 (1877).

♂. Useri river, July.

43. Pratincola axillaris.

Pratincola axillaris, Shelley, P. Z. S. 1884, p. 556; 1885, p. 226.

♂ ♀. Kilimanjaro, 5000 ft., August.

44. Pinarochroa hypospodia.

Pinarochroa hypospodia, Shelley, P. Z. S. 1885, p. 226, pl. 13.

Kilimanjaro, 10,000–12,000 ft.

45. Alcippe kilimensis, n. sp.

Upper half of the head and back of the neck leaden grey, gradually passing into paler grey on the throat and front of the breast; back and scapulars uniform yellowish brown; wings dark brown, all the feathers broadly edged with the same shade as the back; tail-feathers dark brown, partially edged with yellowish brown; centre of the breast white, washed on the sides with grey and then passing into yellowish brown, of a paler shade than the back, on the sides of the body; under tail-coverts ashy white, slightly tinted with pale yellowish brown; under surface of the quills slate-colour, with white inner margins to the feathers; under wing-coverts white. Bill brown, paler towards the base of the lower mandible; legs brown. Total length 5·2 inches, culmen 0·55, wing 2·7, tail 2·6, tarsus 0·85.

Kilimanjaro, 6000 ft., August.

I have placed this bird in the genus *Alcippe*, a genus new to Africa, as its affinities appear to be with *A. cinerea*, Blyth, from Malayana, rather than with any other species known to me. Compared with that bird, it differs mostly in its rather larger bill, its entirely grey head and neck, and in the total absence of rufous shade on the wings and tail.

46. Bradypterus barratti.

Bradypterus barratti, Sharpe, Cat. B. Brit. Mus. vii. p. 115 (1883).

Kilimanjaro.

47. Cisticola hunteri, n. sp.

Similar to *C. subrufipilla*, but a larger bird and much more dingily coloured, distinguished by the almost entire absence of rufous on the quills, and absolute absence of rufous on the tail.

Upper parts dusky brown, with large blackish centres to the feathers; edges of the feathers of the crown and wing slightly more rufous; tail-feathers with pale ends and a broad black subterminal bar, very distinct beneath. Underparts whitish ash, slightly paler and buffer on the chin, upper throat, and centre of the breast; thighs rufous-brown; under surface of the wings dusky black, with the coverts and inner edges of the quills ashy white. Bill black; legs brown. Total length 6 inches, culmen 0·5, wing 2·5, tail 3·1, tarsus 1.

Kilimanjaro.

48. Nectarinia melanogastra.

Nectarinia melanogastra, Fisch. & Rchw. J. f. O. 1884, p. 181; Fisch. Zeitschr. ges. Orn. 1884, p. 337; id. J. f. O. 1885, p. 14.

♂. Ndara.

Three specimens, collected on August 25th. All are in about half moult.

NECTARINIA KILIMENSIS.

tarinia kilimensis, Shelley, P. Z. S. 1884, p. 555; 1885,
.

Kilimanjaro, August.

NECTARINIA REICHENOWI.

panorhynchus reichenowi, Fisch. J. f. O. 1884, p. 56; id.
hr. ges. Orn. 1884, p. 338; id. J. f. O. 1885, p. 139.
tarinia reichenowi, Shelley, P. Z. S. 1884, p. 556, pl. 51; 1885,
.

♀. Kilimanjaro, 5000 ft., August.

CINNYRIS MICRORHYNCHUS.

nyris microrhynchus, Shelley, P. Z. S. 1881, p. 570; Schal.
. 1883, p. 360; Fisch. Zeitschr. ges. Orn. 1884, p. 339; id.
. 1885, p. 139.
Teita. August.

CINNYRIS AFFINIS.

nyris affinis, Rüpp., Shelley, Monogr. Nect. p. 239, pl. 74.
id. P. Z. S. 1885, p. 228.
♀. Kilimanjaro, August.

CINNYRIS MEDIOCRIS.

nyris mediocris, Shelley, P. Z. S. 1885, p. 228.
Kilimanjaro, 5000–6000 ft. ♂ juv. Useri river, July 9.

CINNYRIS HUNTERI, n. sp. (Plate XLI. fig. 2.)

lt male. General plumage velvety black; forehead and front
hree quarters of the crown metallic green, the hinder feathers
ch are glossed with violet; occiput, nape, back, and scapulars
black, with the rump and upper tail-coverts metallic violet;
and tail very dark bronze-brown, with a metallic violet patch
front of the wing, formed by the whole of the least series of
overts; sides of the head and the underparts velvet-black;
llic green moustache from beneath the gape; lower half of
roat and the crop glossy red like sealing-wax, with a few
ic violet bands, most numerous towards the upper throat, where
omewhat form a marginal band between the black upper and
wer throat; the red feathers on the crop have a narrow yellow
etween their red ends and black bases; under wing-coverts
black; quills and tail as above; bill and legs black. Total
5·6 inches, culmen 1·1, wing 2·85, tail 2·1, tarsus 0·7.
females as well as the young males are almost indistinguishable
kins in corresponding plumage of *C. gutturalis*.
m all the other scarlet-throated Sun-birds, the present species
nguished by the metallic patch on the wing-coverts and lower

♀. Useri river, July.

55. Cinnyris kirki.

Cinnyris kirki, Shelley, P. Z. S. 1881, p. 571; Fisch. Zeitschr. ges. Orn. 1884, p. 339; id. J. f. O. 1885, p. 139; Shelley, P. Z. S. 1885, p. 228; id. Ibis, 1888, p. 300.

Nectarinia kalckreuthi, Böhm, J. f. O. 1883, p. 194.

Cinnyris kalckreuthi, Schal. J. f. O. 1883, p. 359.

♂. Kilimanjaro, 5000 ft., August.

56. Anthreptes longuemarii.

Anthreptes longuemarii, Shelley, Monogr. Nect. p. 335, pl. 108; Schal. J. f. O. 1883, p. 360; Shelley, P. Z. S. 1888, p. 39.

Anthreptes orientalis, Hartl. J. f. O. 1880, p. 213; Fisch. Zeitschr. ges. Orn. 1884, p. 339.

Nectarinia longuemarii, Böhm, J. f. O. 1883, p. 194; Schal. J. f. O. 1887, p. 248.

Anthothreptes orientalis, Fisch. J. f. O. 1885, p. 138; Rchw. J. f. O. 1887, p. 75.

Anthothreptes longuemarii, Matsch. J. f. O. 1887, p. 155.

♂ ♀. Useri river, August.

57. Anthothreptes hypodila.

Anthodiæta hypodila (Jard.), Shelley, Monogr. Nect. p. 345, pl. 111. figs. 1, 2.

Anthodiæta zambesiana, Shelley, *t. c.* p. 343, pl. 111. fig. 3; Schal. J. f. O. 1883, p. 360; Fisch. Zeitschr. ges. Orn. 1884, p. 339; id. J. f. O. 1885, p. 138.

Anthreptes zambesiana, Shelley, P. Z. S. 1881, p. 571.

Nectarinia collaris, Böhm, J. f. O. 1883, p. 192; 1885, p. 46; Schal. J. f. O. 1887, p. 242.

Anthodiæta collaris, Matsch. J. f. O. 1887, p. 155.

Anthreptes hypodila, Shelley, P. Z. S. 1888, p. 39.

♂ ♀. Taveta, August.

58. Zosterops perspicillata, n. sp. (Plate XLI. fig. 1.)

Adult female. General plumage above bright olive-yellow; a slight rufous shade on the sides of the forehead; eye surrounded by a very broad band of silky-white feathers 0·15 inch wide; wings and tail slaty black; wing-coverts olive-yellow like the back; primary-coverts and quills with broad olive-yellow outer edges, slightly paler and yellower on the primaries; tail uniform, with no pale edges to the feathers; throat and under surface of the body bright yellow, passing into olive-yellow on the sides of the neck and body; under wing-coverts white, partially washed with yellow; quills slaty black, with partial white inner margins. Bill black; legs slaty grey, nails brown. Total length 4·4 inches, culmen 0·45, wing 2·55, tail 2·1, tarsus 0·75.

Adult male. Similar in plumage. Total length 4·2 inches, culmen 0·45, wing 2·5, tail 2, tarsus 0·75.

The specific characters of this species may be summed up as follows:—the white patch of feathers surrounding the eye very broad,

as broad as the diameter of the eye; an entire absence of black on the sides of the head, and no yellow on the forehead, which is uniform with the mantle, only with a rufous tinge on its sides.

♂ ♀. Kilimanjaro, 5000 ft., August.

59. SERINUS STRIOLATUS.

Poliospiza striolatus, Fisch. Zeitschr. ges. Orn. 1884, p. 321.
Crithagra striolatus, Fisch. J. f. O. 1885, p. 136.
Serinus striolatus (Rüpp.), Sharpe, Cat. B. Brit. Mus. xii. p. 363 (1888).

♂. Kilimanjaro, 5000 ft., August 9.

60. CHRYSOMITRIS CITRINELLOIDES.

Chrysomitris citrinelloides (Rüpp.), Sharpe, Cat. B. Brit. Mus. xii. p. 229.

Kilimanjaro.

61. EMBERIZA FLAVIVENTRIS.

Emberiza flaviventris (Bonn. et Vieill.), Böhm, J. f. O. 1883, p. 202; Schal. *t. c.* p. 364; Sharpe, Cat. B. Brit. Mus. xii. p. 499.

♂. Useri river.

62. SPERMESTES CUCULLATUS.

Spermestes cucullatus, Swains.; Shelley, P. Z. S. 1881, p. 587; Böhm, J. f. O. 1883, p. 200; Fisch. Zeitschr. ges. Orn. 1884, p. 323; id. 1885, p. 136; Shelley, P. Z. S. 1886, p. 309.

♂. Ndara in Teita, August 25.

63. ESTRELDA QUARTINIA.

Estrelda quartinia, Bp.; Shelley, Ibis, 1886, p. 331.

♂. Kilimanjaro, August 6.

64. VIDUA HYPOCHERINA.

Vidua splendens, Rchw., Shelley, P. Z. S. 1881, p. 587; Fisch. Zeitschr. ges. Orn. 1884, p. 325; id. J. f. O. 1885, p. 135.
Vidua hypocherina, Verr., Shelley, Ibis, 1886, p. 340; id. Ibis, 1888, p. 302.

Plains south of Kilimanjaro.

65. VIDUA FISCHERI.

Linura fischeri, Rchw. J. f. O. 1882, p. 350, pl. 2. fig. 1; Fisch. Zeitschr. ges. Orn. 1884, p. 325; id. J. f. O. 1885, p. 135.
Vidua fischeri, Shelley, Ibis, 1886, p. 342; 1888, p. 292.

Plains south of Kilimanjaro.

66. PLOCEUS AUREOFLAVUS.

Hyphantornis aureoflavus, Shelley, P. Z. S. 1881, p. 584; Schal. J. f. O. 1883, p. 362; Fisch. Zeitschr. ges. Orn. 1884, p. 330.
Ploceus aureoflavus, Smith, Shelley, Ibis, 1887, p. 26.

♂. Taveta.

67. Textor dinemelli.

Textor dinemelli, Horsf., Cab. J. f. O. 1878, p. 233; Shelley, P. Z. S. 1882, p. 307; Böhm, J. f. O. 1883, p. 196; Schal. *t. c.* p. 361; Fisch. Zeitschr. ges. Orn. 1884, p. 333; id. J. f. O. 1885, p. 132; Shelley, Ibis, 1887, p. 44.

Useri river.

68. Oriolus notatus.

Oriolus notatus, Peters; Shelley, P. Z. S. 1881, p. 576; Fisch. Zeitschr. ges. Orn. 1884, p. 334; id. J. f. O. 1885, p. 132; Shelley, P. Z. S. 1885, p. 229.

Taveta.

69. Oriolus brachyrhynchus.

Oriolus brachyrhynchus, Swains., Shelley, P. Z. S. 1881, p. 576.

♀. Teita, July 24.

70. Lamprocolius sycobius.

Lamprocolius sycobius, Peters, Shelley, P. Z. S. 1881, p. 583; Böhm, J. f. O. 1883, p. 197; Schal. *t. c.* p. 361; Fisch. J. f. O. 1885, p. 132; Rchw. J. f. O. 1887, p. 66.

♂. Duruma, August 29.

71. Pholidauges fischeri.

Notauges fischeri, Rchw. J. f. O. 1884, p. 54; Fisch. Zeitschr. ges. Orn. 1884, p. 335, pl. 20. fig. 1; id. J. f. O. 1885, p. 132; Rchw. J. f. O. 1887, p. 66.

♂. Kilimanjaro, 6000 ft., in forest.

This specimen differs considerably from the type; but I do not hesitate to refer it to the same species, as an adult male in full plumage.

Entire head, neck, back, scapulars, and least series of wing-coverts glossy violet shaded blue-black; remainder of the wings and the tail black glossed with dark green, with no violet shade. Beneath, the purple-black of the head and neck extends from the chin over the front half and centre of the chest; remainder of the breast and under tail-coverts creamy white, with the flanks, axillaries, and under surface of the wings black. Bill and legs black. Total length 6·3 inches, culmen 0·5, wing 3·85, tail 2·8, tarsus 0·9.

72. Corvultur albicollis.

Corvultur albicollis (Lath.), Sharpe, Cat. B. Brit. Mus. iii. p. 24 (1877); Shelley, P. Z. S. 1885, p. 229; id. Ibis, 1888, p. 294.

Archicorax albicollis, Böhm, J. f. O. 1883, p. 195; Fisch. Zeitschr. ges. Orn. 1884, p. 336; id. J. f. O. 1885, p. 131; Rchw. J. f. O. 1887, p. 65; Matsch. *t. c.* p. 153.

Corax albicollis, Schal. J. f. O. 1887, p. 240.

Kilimanjaro. Seen as high as 15,000 ft.

73. Treron wakefieldi.

Treron wakefieldi, Sharpe, Shelley, P. Z. S. 1881, p. 595; id. Ibis, 1883, p. 269; Schal. J. f. O. 1883, p. 242; Fisch. J. f. O. 1885, p. 118; Shelley, P. Z. S. 1885, p. 229; id. Ibis, 1888, p. 303.

Treron nudirostris, Böhm, J. f. O. 1883, p. 199.

♂. Duruma, August 29.

74. Columba guineensis.

Columba guineensis, Böhm, J. f. O. 1882, p. 199; Shelley, Ibis, 1883, p. 278; Schal. J. f. O. 1883, p. 343; Fisch. J. f. O. 1885, p. 119; Rchw. J. f. O. 1887, p. 51.

♂. Swamp on east side of Kilimanjaro, June 24.

75. Turtur lugens.

Turtur lugens (Rüpp.), Shelley, P. Z. S. 1881, p. 596; 1882, p. 310; id. Ibis, 1883, p. 302; Fisch. J. f. O. 1885, p. 119; Hartl. Zool. Jahrb. ii. p. 330 (1887).

Turtur sp. ?, Schal. J. f. O. 1885, p. 54; Matsch. J. f. O. 1887, p. 157.

♂. Taveta, July 30.

76. Turtur semitorquatus.

Turtur semitorquatus (Rüpp.), Shelley, P. Z. S. 1881, p. 596; Böhm, J. f. O. 1882, p. 198; Shelley, Ibis, 1883, p. 303; Fisch. J. f. O. 1885, p. 118; Rchw. J. f. O. 1887, p. 51; Shelley, P. Z. S. 1888, p. 45; id. Ibis, 1888, p. 303.

♂. Kilimanjaro, 5000 ft., August 9.

77. Chalcopelia afra.

Chalcopelia afra (Linn.), Shelley, P. Z. S. 1881, p. 597; Böhm, J. f. O. 1882, p. 197; Shelley, Ibis, 1883, p. 323; Schal. J. f. O. 1883, p. 342; Fisch. J. f. O. 1885, p. 119; Rchw. J. f. O. 1887, p. 51; Matsch. *t. c.* p. 147; Shelley, Ibis, 1888, p. 303.

Chalcopelia chalcospilos, Shelley, P. Z. S. 1881, p. 596.

Forests of Taveta.

This specimen has the metallic patch on the wing green.

78. Tympanistria tympanistria.

Tympanistria tympanistria (Temm.), Shelley, Ibis, 1883, p. 326; id. P. Z. S. 1885, p. 230.

Peristera tympanistria, Shelley, P. Z. S. 1881, p. 597; Fisch. J. f. O. 1885, p. 119; Rchw. J. f. O. 1887, p. 51; Matsch. *t. c.* p. 147.

♂. Taveta.

79. Pterocles decoratus.

Pterocles decoratus, Cabanis, J. f. O. 1868, p. 413.

Useri river, June.

80. Pterocles exustus.

Pterocles exustus, Temm.; Fischer, Zeitschr. ges. Orn. 1884, p. 379.

Useri river, June.

81. Pterocles gutturalis.

Pterocles gutturalis, Smith; Fischer, *l. c.*

Useri river, June.

82. Pternistes humbolti.

Pternistes nudicollis (nec Gm.), Shelley, P. Z. S. 1881, p. 597; Fisch. J. f. O. 1885, p. 121.

Francolinus (*Pternistes*) *leucoparæus*, Fisch. & Rchw. J. f. O. 1884, p. 263.

Pternistes leucoparæus, Fisch. J. f. O. 1885, p. 121.

Tana River, 50 miles from the mouth, September.

83. Pternistes infuscatus.

Francolinus infuscatus, Cab., v. d. Decken's Reis. iii. p. 44, pl. 14 (1869); Cab. J. f. O. 1878, p. 244; Shelley, P. Z. S. 1882, p. 310.

Pternistes infuscatus, Fisch. J. f. O. 1885, p. 120.

Useri river, July 9.

84. Francolinus altumi.

Francolinus altumi, Fisch. & Rchw. J. f. O. 1884, p. 179, pl. 2; Fisch. J. f. O. 1885, p. 120; Shelley, P. Z. S. 1885, p. 230; Rchw. J. f. O. 1887, p. 51; Matsch. *t. c.* p. 139.

Francolinus (*Scleroptera*) *hildebrandti*, Cab. J. f. O. 1878, pp. 206, 243, pl. 4. fig. 2.

Francolinus (*Scleroptera*) *schuetti*, Cab. J. f. O. 1880, p. 351; 1881, pl. 2.

Francolinus hildebrandti, Fisch. J. f. O. 1885, p. 120.

Francolinus schuetti, Shelley, P. Z. S. 1885, p. 230; Fisch. J. f. O. 1885, p. 120.

♂. Useri river. ♀. Kilimanjaro, August.

85. Francolinus granti.

Francolinus granti, Hartl., Shelley, P. Z. S. 1881, p. 597; Fisch. J. f. O. 1885, p. 119; Rchw. J. f. O. 1887, p. 52; Shelley, P. Z. S. 1888, p. 48; id. Ibis, 1888, p. 303.

Francolinus ochreogaster, Hartl. J. f. O. 1882, p. 327.

♂ ♀. Useri river, July.

The two specimens, labelled male and female, are perfectly similar in plumage.

86. Francolinus coqui.

Francolinus coqui, Smith, Böhm, J. f. O. 1882, p. 194; Schal. J. f. O. 1883, p. 341; Matsch. J. f. O. 1887, p. 147.

Scleroptera subtorquata, Cab. J. f. O. 1878, p. 243.

♂ ♀. Duruma, August.

87. Numida vulturina.

Acryllium vulturina (Hardwicke), Elliot, Monogr. Phas. ii. pl. 38 (1872); Cab. J. f. O. 1878, p. 244.

Numida vulturina, Fisch. & Rchw. J. f. O. 1880, p. 140.

♂ ♀. Useri river, July 1. Particularly common in thin thorny bush on the Tana and Duruna.

88. Numida pucherani.

Numida pucherani, Hartl., Shelley, P. Z. S. 1881, p. 597; Fisch. J. f. O. 1885, p. 119; Rchw. J. f. O. 1887, p. 51.

In thick forest by streams at the foot of Kilimanjaro; also noticed on the banks of the Tana in forest.

89. Plectropterus gambensis.

Plectropterus gambensis (Linn.), Böhm, J. f. O. 1882, p. 182; Fisch. Zeitschr. ges. Orn. 1884, p. 393; Böhm, J. f. O. 1885, p. 38; Fisch. *t. c.* p. 115; Rchw. J. f. O. 1887, p. 46; Matsch. *t. c.* p. 144.

Swamp near Tareba.

90. Pœcilonitta erythrorhyncha.

Pœcilonitta erythrorhyncha, Smith, Ill. Zool. S. Afr. pl. 104 (1845); Shelley, Ibis, 1888, p. 307.

Anas erythrorhynchus, Shelley, P. Z. S. 1882, p. 310; Fisch. Zeitschr. ges. Orn. 1884, p. 394; Böhm, J. f. O. 1885, p. 62.

Querquedula erythrorhyncha, Fisch. J. f. O. 1885, p. 115; Matsch. J. f. O. 1887, pp. 136, 144.

♀. Kilimanjaro, east side, June 24.

91. Sarcidiornis africanus.

Sarcidiornis africanus (Penn.), Shelley, P. Z. S. 1881, p. 601.

♀. Kilimanjaro, swamp on east side, June 24.

92. Eupidotis maculipennis.

Lissotis maculipennis, Cab. v. d. Decken's Reis. iii. p. 45, pl. 15 (1869).

Otis maculipennis, Fisch. Zeitschr. ges. Orn. 1884, p. 388; id. J. f. O. 1885, p. 116.

♂. Useri river, in bush, July 17.

93. Œdicnemus capensis.

Œdicnemus capensis, Licht., Fisch. Zeitschr. ges. Orn. 1884, p. 389; id. J. f. O. 1885, p. 116; Seebohm, Geogr. Distr. Charadr. p. 81 (1888).

Swamp on east side of Kilimanjaro.

94. Cursorius cinctus.

Hemerodromus cinctus, Heugl. Ibis, 1863, p. 31, pl. 1.

Cursorius cinctus, Heugl. Orn. N.O.-Afr. ii. p. 972 (1870);

Fisch. & Rchw. J. f. O. 1879, p. 337; Fisch. Zeitschr. ges. Orn. 1884, p. 390; id. J. f. O. 1885, p. 115; Rchw. J. f. O. 1887, p. 46; Seebohm, Geogr. Distr. Charadr. p. 245.

♂. Useri river, July 18.

95. VANELLUS SPECIOSUS.

Hoplopterus speciosus, Fisch. Zeitschr. ges. Orn. 1884, p. 391; id. J. f. O. 1885, p. 116; Rchw. J. f. O. 1887, p. 47; Matsch. *t. c.* p. 138.

Vanellus speciosus (Licht.), Seebohm, Geogr. Distr. Charadr. p. 221.

♂ ♀. Kilimanjaro, swamps on the east side, June 24.

4. Description of Hunter's Antelope. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 18, 1889.]

(Plate XLII.)

At the meeting of this Society held on the 12th of February last I exhibited specimens of a very fine new Antelope, recently discovered by Mr. H. C. V. Hunter, F.Z.S., in Eastern Africa, and proposed to name it after its discoverer *Damalis hunteri*[1]. I have now had time to make a closer examination of Mr. Hunter's specimens and to complete my description of this interesting species, of which I exhibit a water-colour sketch, kindly prepared for us by Mr. Wolf from one of the skins (Plate XLII.).

As will be at once manifest from an inspection of the drawing and the specimens themselves, Hunter's Antelope belongs to the genus *Damalis*, if this be kept separate from *Alcelaphus*, being allied in most points of structure to the Korrigum or Senegal Harteheest (*Damalis senegalensis*). But it has the frontal part of the skull slightly more elongated than in *D. senegalensis*, and in this respect shows a divergence towards the genus *Alcelaphus*. It may be characterized as follows:—

DAMALIS HUNTERI. (Plate XLII.)

Fusco-castaneus unicolor, in dorso paulo saturatior: linea inter oculos, in medio fronte ascendente, alba; oculorum ambitu et auribus intus, necnon cauda et gastræo medio albis: artubus intus pallidioribus: cornubus nigris, rotundatis, fortiter annellatis, extrorsum et retrorsum curvatis, deinde linea fere parallelis exsurgentibus; apicibus lævigatis vix convergentibus. Alt. tota ad humeros circa 48·0, *long. corp.* 48·0, *caudæ* 15·0, *aurium* 6·0,

[1] See P. Z. S. 1889, p. 58; and 'Field,' March 23, 1889 (vol. lxxiii. p. 422).

cranii superioris 13·5, *cornuum a fronte linea directa* 21 *poll. Angl. et dec.* Fem. *mari similis, sed paulo minor et cornubus valde tenuioribus.*

Hab. Africam orientalem, in ripis fl. Tana.

Fig. A.

Head of *Damalis hunteri* (from a photograph).

Mr. Hunter has placed at my disposal the following series of specimens of this Antelope:—

(1) Skull and horns of adult male (fig. B, p. 374), marked "H. 3".

These horns are remarkable for their size and strength. They measure about 24 inches in length along the curve, and about 20½ inches in a straight line from the base to the point. Their circum-

Fig. B.

Skull and horns of *Damalis hunteri*, ♂ ad.

ference at the base is about 8 inches. As will be seen by the figure (B, p. 374), they are very strongly ringed from the base for about two thirds of their length. These rings are most developed on the front

es, and are almost obsolete behind. In the terminal half the tions become more distant from each other and only apparent

Fig. C.

Skull and horns of *Damalis hunteri*, ♀ ad.

, and finally vanish in the smooth and pointed ends. Rising e frontal bones the horns curve at first slightly frontwards

and outwards. About 4 inches above the base they turn backwards and outwards for about 7 inches, thence they rise up in a nearly straight line with the front of the skull, and terminate in long smooth tips, which towards their extremities approach one another very slightly.

The length of the skull of this specimen from the occipital foramen to the end of the palatal bones is about 15 inches, that of the frontal surface along the middle line 13½ inches, that of the molar series 3·7 inches; the extreme breadth of the skull at the orbits is 5·7 inches.

(2) Skull and horns of adult female (fig. C, p. 375), marked "H. 84."

This specimen is in fact a miniature of that of the male, though there are some noticeable differences. As a whole the horns are proportionately longer, much more slender, and less strongly built. The smooth apical portions are nearly straight, and are rather divergent than convergent at the tips.

The length of these horns along the frontal ridge is about 20 inches: the distance from the base to the point in a straight line 18½ inches, and the girth at the base about 5·3 inches. The length of the skull from the occiput to the end of the palate is 13¼ inches, not much less than that of the male, but the skull is proportionately narrower, being only 5·2 in the extreme breadth of the orbits.

The skin of this specimen accompanies the skull and horns, and is that from which Mr. Wolf has prepared his sketch (Plate XLII.). The diagnosis above given has been also taken from this specimen.

(3) Skull and horns of a young male, marked "H. 73."

These are not materially different from those of the adult, except in their rather smaller dimensions, but the tips are more convergent at their extremities.

(4 and 5) Two skins—one marked "H. 90," the other unlabelled, concerning which I have not yet been able to ascertain particulars. But examination of them does not show any material differences in colour or structure.

Mr. Hunter's notes upon this Antelope are as follows:—

"We first met with this Antelope about 150 miles up the Tana River. It is only found for certain on the north bank of the river. It frequents the grassy plains principally, but I have also often seen it in thin thorny bush. It is generally met with in herds of from 15 to 25 individuals.

"At the time of the year when I came across them (October and November) I saw several young ones in the herds. The banks of the Tana River are fringed with a thin belt of forest, then the ground rises slightly and one sees extensive plains dotted here and there with large patches of bush, composed principally of Euphorbias and Aloes. The Lesser Koodoo (*Strepsiceros imberbis*) lives principally in these patches and feeds outside of them in the early mornings and evenings. When I first saw the new Antelope I was stalking two examples of *Gazella walleri*, and though I saw the Hunter's Antelope in the distance I

k them for Impálas, which, however, are not found on the Tana
ıer bank.
was only when I fired at the Gazelles, and the Hunter's Ante-
a pair of young males) ran away, that I noticed that they were
ing new to me. They ran with rather a heavy gallop like a
eest. I then had a very long track after them, and managed
the young male which I first sent you.
e did not come across these Antelopes again for some days, but
net with them in large numbers and got several specimens.
eemed to me to have more vitality than any other Antelope
ever killed. This species certainly does not extend down to
ast, but we saw them as far as the furthest point we reached
250 miles) up the river, at a place called Mussa. Their Galla
is '*Herola*,' not '*Haranta*,' as given in your original de-
on (*suprà*, p. 59)."

the Oligochætous Fauna of New Zealand, with pre-minary Descriptions of new Species. By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received June 12, 1889.]

only papers dealing with the Oligochæta of New Zealand are
rd (**4**), Dr. Hutton (**8**), Mr. W. W. Smith (**15**), and myself
3). The papers of Dr. Hutton contain short descriptions of
vorms, accompanied by a few figures illustrating the form of
ostomium and the distribution of the setæ. The species are
erred to the genera *Lumbricus* and *Megascolex*; but it is
lear from Dr. Hutton's statement as to their characters that a
erable number of species are wrongly identified with *Lumbricus*,
at they belong to other genera, especially to *Acanthodrilus*.
is the case with *Lumbricus uliginosus*, which is possibly
al with either *Acanthodrilus novæ zelandiæ*, *A. dissimilis*, or
e. *Lumbricus campestris* may perhaps be my *Neodrilus mono-*
it is stated by Captain Hutton to possess "male genital
gs on the ninth segment. Vulvæ on the two last segments of the
m." The "male genital openings" are clearly the spermathecal
while the "vulvæ" are no doubt the atrial pores. Inasmuch as
n Hutton describes the atrial pores of *Lumbricus uliginosus* as
ing the last three segments of the clitellum, it seems possible
ne presence of only two pairs of apertures in *L. campestris* may
the atrial pores of the xviith segment and the male pores of seg-
xviii., which I have recorded as characterizing *Neodrilus*. The
atic position of *Lumbricus levis* is hard to understand from the
otion given in Captain Hutton's paper.
mbricus annulatus is, as Captain Hutton states, not far removed
Allolobophora fœtida. Having examined specimens from New
d of a species which I cannot distinguish from *A. fœtida*, I am
d to think that there is no necessity to recognize *A. annulata*

as distinct. The statement that the latter form differs from its European ally in the presence of the male pores on segment xvi. (instead of xv.) requires careful verification.

The two species of *Megascolex* recorded by Hutton, although evidently differing from each other, are not sufficiently described to permit of their being recognized.

In a later paper (9), Captain Hutton gives a brief epitome of Perrier's memoir upon the Classification of Earthworms (13), and in a footnote states that his *Lumbricus uliginosus* is probably an *Acanthodrilus*, and that *L. levis* and *L. campestris* are probably referable to the genus *Digaster*. This paper was unknown to me when I published my earlier paper upon New-Zealand Earthworms (1).

Genus Acanthodrilus, Perrier[1].

Mandane, Kinberg, Öfvers. K. Vetensk.-Akad. 1866, p. 97.
Acanthodrilus, Perrier, Nouv. Arch. Mus. t. viii. (1872), p. 85.

Earthworms with 8 setæ, arranged either in pairs or the individual setæ implanted at some distance. Clitellum occupying more or fewer of segments xiii.–xix. Prostomium well developed. Vasa deferentia separate up to their point of opening on xviii.; two pairs of tubular atria (=*prostates*, auctorum) opening independently of vasa deferentia on to segments xvii. and xix. Penial setæ rarely absent (in *A. multiporus*). Oviducal pores paired upon segment xiv. Testes in x. and xi. Ovaries in xiii. Spermathecæ two (rarely 3, in *A. communis*) pairs in viii. and ix., always furnished with diverticula.

1. Acanthodrilus multiporus, F. E. B.
Acanthodrilus multiporus, F. E. Beddard, P. Z. S. 1885, p. 813.

2. Acanthodrilus novæ zelandiæ, F. E. B.
Acanthodrilus novæ zelandiæ, F. E. Beddard, ibid. p. 813.

3. Acanthodrilus dissimilis, F. E. B.
Acanthodrilus dissimilis, F. E. Beddard, ibid. p. 813.

4. Acanthodrilus annectens, F. E. B.
Acanthodrilus annectens, F. E. Beddard, Quart. Journ. Micr. Sci. vol. xxix. p. 102.

5. Acanthodrilus antarcticus, n. sp.
Prostomium not completely dividing the buccal segment.
Setæ disposed in 8 longitudinal rows; 1 & 2 are closer together than 3 & 4.
Dorsal pores present in all segments after the viith.
Clitellum extends over segments xiii.–xvii.

[1] Rosa (14), on the grounds of priority, has reinstated Kinberg's name for this genus, inasmuch as Perrier has shown that *Mandane* and *Acanthodrilus* are synonymous. But Vaillant (16) has recently pointed out that Kinberg himself has used the generic name *Mandane* twice over; it was first used for a genus of marine Annelids. Under these circumstances I retain Perrier's name *Acanthodrilus*.

l blood-vessel completely double.
entary tract. The gizzard occupies segments vi. & vii.
ous glands appear as a dilatation of the walls of the œsopha-
egments xiv. & xv.
segmental septa dividing segments vii.–xii. specially thickened.
al sacs in segments ix., x., xi., xii.; those of the last two
ts are racemose in appearance.
ridia diffuse, with numerous external pores.
natheca furnished with a variable number of small diver-

CANTHODRILUS ROSÆ, n. sp.

tomium completely dividing the buccal segment.
strictly paired, the pairs, at least in the posterior region of the
eing equidistant.
llum extending over segments xiv.–xix.
al pores present in the posterior segments of body.
al blood-vessel double, but the two tubes unite at the point
hey perforate the septa.
segmental septa not specially thickened in the anterior
ts.
ridia one pair to each segment, alternating in position, some-
pening by dorsal, sometimes by ventral pair of setæ.
mathecæ with a long muscular diverticulum, bearing at its
ity a cluster of small pouches.

Genus DEINODRILUS, F. E. B.

odrilus, F. E. Beddard, Quart. Journ. Micr. Sci. vol. xxix.

hworms with 12 setæ in each segment, arranged at approxi-
equidistant intervals. Prostomium not completely dividing
lobe. Clitellum occupies 3 segments (xiv.–xvi.) as in *Perichæta*.
dia diffuse, opening on to exterior by numerous pores in each
t. Reproductive organs as in *Acanthodrilus*, *i. e.* two pairs of
atria opening on to segments xvii. and xix. Vasa deferentia
segment xviii. Dorsal blood-vessel completely double.

DEINODRILUS BENHAMI, F. E. B.

odrilus benhami, F. E. Beddard, Quart. Journ. Micr. Sci.
ix. p. 105.

Genus PERICHÆTA, Schmarda.

chæta, Schmarda, Neue wirbellose Thiere, Bd. ii. p. 13.
ascolex, Horst, Notes from Leyd. Mus. vol. v. p. 182.
chæta, Perrier, Nouv. Arch. Mus. t. viii. p. 96.
he arrangement of the species of this very large genus is under-
revision, I abstain from attempting a generic definition. The
described below perhaps merits generic separation, as it differs
ost other species in such important points as the possession of
r atria and paired nephridia.

8. PERICHÆTA INTERMEDIA, n. sp.

The *prostomium* does not divide the buccal segment.

The *setæ* form a nearly complete ring round each segment, failing for a short space in the mid-dorsal and mid-ventral lines.

Dorsal pores absent.

Clitellum ?

Alimentary tract. The gizzard lies in segment v.; it is small and inconspicuous. The calciferous glands present the appearance of dilatations of the œsophagus in segments x. and xi.

Nephridia are a series of paired tubes, opening by laterally placed orifices.

Sperm-sacs in segments ix., x., xi., xii.

Vasa deferentia open on to segments x. and xi.

The *atrium* is tubular as in *Acanthodrilus*; it is not furnished with a sac of penial setæ; the vas deferens of each side appears to open in common with it.

Intersegmental septa separating segments viii.–xv. very greatly thickened.

Receptacula ovorum are conspicuous on the anterior septum of segment xiv.

Spermathecæ four pairs in segments v.–viii.; each is furnished with a minute diverticulum lying to the inner side.

9. PERICHÆTA ANTARCTICA (Baird).

Magascolex (*Perichæta*) *antarctica*, Baird, Journ. Linn. Soc. vol. xi. p. 96.

P. antarctica, Beddard, Proc. Roy. Soc. Edinb. vol. xiv. p. 175.

Genus NEODRILUS, F. E. B.

Neodrilus, F. E. Beddard, P. R. Soc. Edinb. vol. xiv. p. 157.

Closely resembling *Acanthodrilus*, but differing in the presence of only a single pair of tubular atria in segment xvii. and a single pair of spermathecæ in viii. Each spermatheca is furnished with a very large diverticulum lying in the anterior segment. Nephridia paired and alternate in position.

10. NEODRILUS MONOCYSTIS, F. E. B.

N. monocystis, F. E. Beddard, P. R. Soc. Edinb. vol. xiv. p. 157.

RHODODRILUS, nov. gen.

Setæ in 8 series. Clitellum occupying segments xiv.–xvii.; atria tubular; penial setæ present; vasa deferentia opening on to the exterior on the same segment (xvii.), but independently of atria; gizzard present.

This genus comes near to *Cryptodrilus* and *Megascolides*, and possibly includes some species described by Fletcher (5) under these two genera. In the former genus I place those species with *lobate* atria like those of *Perichæta*; *Megascolides* includes species which have *tubular* atria, *no* penial setæ, and a clitellum extending as far as segment xx. or further.

11. Rhododrilus minutus, n. sp.

A small species one inch in length.

Prostomium extending over a portion of peristomial ring, but not (?) completely dividing it.

Dorsal pores present after clitellum.

Dorsal blood-vessel single.

Alimentary tract. The gizzard occupies segment v.; there are no calciferous glands.

Intersegmental septa separating segments vi.–xii. specially thickened.

Sperm-sacs in segments xi., xii. racemose.

Nephridia paired, opening in front of third setæ.

Spermathecæ four pairs in segments vi.–ix.; each sac with a single diverticulum longer than spermatheca and dilated at its extremity.

Genus Tubifex, Lamarck.

Tubifex, Lamarck, Hist. Nat. Anim. sans Vertèbres, t. iii. p. 228.

12. Tubifex rivulorum, Lamarck, Hist. Nat. Anim. sans Vertèbres, t. iii. p. 228.

Genus Limnodrilus, Claparède.

Limnodrilus, Claparède, Mém. Soc. Phys. Genève, t. xvi.

13. Limnodrilus, sp. inc.

A species of *Limnodrilus* appears to occur very abundantly in New Zealand; but as none of the specimens which I have examined were sexually mature, and as I have not had an opportunity of studying the living worm, I do not feel able to identify the species.

Genus Rhreoryctes, Hoffmeister.

Rhreoryctes, Hoffmeister, Die bis jetzt bekannten Arten aus der Familie der Regenwürmer, p. 40.

14. Rhreoryctes smithi, F. E. B.

Rhreoryctes smithii, F. E. Beddard, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 389.

Besides the above-named species, I have received examples of *Lumbricus* and *Allolobophora* which I have not yet worked out. Dr. Benham informs me that he has received specimens of a *Eudrilus* from New Zealand.

The list of New-Zealand Earthworms which is published in the present paper is principally based upon the examination of two large collections, which were kindly made for me by Mr. W. W. Smith in the neighbourhood of Ashburton, and of one collection which Prof. T. J. Parker, F.R.S., was so good as to forward me from Dunedin. As the same species occurred abundantly in all these collections, I suppose that the list which I am now able to present to the Society contains a fair sample of the earthworm fauna of the country.

I wish therefore to point out, of course with due reserve, the con-

clusions as to the distribution of the group to which my results appear to point.

(1) The oligochætous fauna of New Zealand differs markedly from that of Australia; the characteristic genera, consisting of numerous species, are *Megascolides*, *Perichæta*, and *Cryptodrilus* (Fletcher, 5). The characteristic New-Zealand form is evidently *Acanthodrilus*, of which only one species has as yet been found in Australia. *Perichæta*, of which a large number of species occur in Australia, is not an abundant form in New Zealand. *Rhododrilus* and *Neodrilus* may be peculiar genera. *Deinodrilus* has not been met with elsewhere.

(2) The fauna of New Zealand presents a marked agreement with that of Kerguelen (Lankester, 10), Marion Island, Patagonia (Rosa, 14), the Falkland Islands (Beddard, MS.), and South Georgia (Michaelsen, 11); in all these places the only genus known being *Acanthodrilus*. With regard to the terrestrial Oligochæta, therefore, it seems permissible to speak of an "Antarctic fauna."

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n new Genera and Species of Coleopterous Insects from Mount Kinibalu, North Borneo. By H. W. Bates, F.R.S., F.Z.S.

[Received June 18, 1889.]

e following descriptions contain the results of the examination of ion only of the collection of Coleoptera made by Mr. J. White- during his recent visit to Kinibalu, undertaken, as is well n, chiefly for the purpose of investigating the ornithology of strict. The Coleoptera comprise an unusual proportion of new emarkable forms. The whole series has passed into the rich tion of Mr. Alexander Fry.

Fam. Cicindelidæ.

ERATES WHITEHEADI.

. spectabili (*Schaum*) *similis et affinis, sed differt, inter alia, eculorum pedunculis fere verticalibus fronteque angustiore. E majoribus, nigro-viridis, elytris viridioribus: thorace angusto, ateribus medio minime rotundatis: elytris apice longe spinosis, pinis divaricatis et oblique elevatis, margine exteriore versus pinam continuo nec emarginato, angulo suturali distincto etsi otunduto, deinde margine usque ad spinæ basin minus obliquo: lorso sicut in* Th. spectabili *multituberoso, vittula humerali alloque obliquo discoidali albo-testaceis: pedibus nigris, coxis emoribusque basi et subtus albo-testaceis: abdominis margine t apice rufo-testaceis. Labrum margine antice* ♂ 8-, ♀ 6-*den-iculatum. Long.* 16 *millim.*

is beautiful species differs from *Th. spectabilis* (Schaum) and *eps* (Bates) in the more vertically elevated peduncles of the which position perceptibly narrows and deepens the forehead en them. It also differs in the outline of the apical margin e elytra, the suture forming a distinct though rounded angle, ce to the base of the spine the apical margin is not continuous the spine, as it is very nearly in the two other species. The alities of the surface are the same in all—the common basal ion being quadrate and plane above, tuberculated on its mar- and the disk having a rounded tubercle before and an oblique ated callus behind the middle.

. Whitehead obtained also examples of the following species of delidæ:—*Cicindela crespignyi* (Bates, since redescribed as *C. ana*, Dokhtouroff) in a distinct colour variety, the broad orange- ed belt and stripe of the type-form (from near Labuan) being ed by white; the rare *Heptadonta tricondyloides* (Gestro); *tes punctipennis* (Bates), many examples, all alike in the uni- pale colour of the elytra, but still little more than a colour y of *T. schaumi* (Chaud.); and *Tricondyla beccarii* (Gestro).

Fam. Carabidæ.

Oodes (Simous) borneensis.

O. æneo (*Laferté*) *proxime affinis, sed differt corpore angustiore supra multo minus polito, præterea colore violaceo vel viridi-cyaneo etc. Anguste elongato-oblongus; palpis, antennis tarsisque (vel pedibus totis) picescenti-rufis: thorace post medium latiore, antice valde angustato, supra lævi, puncto setifero ad angulum posticum: elytris tenuiter sed acute crenulato-striatis, margine ante apicem sat fortiter sinuato, interstitiis planis, 3us longe post medium unipunctato: subtus niger, nitidus. Long.* 15-16 *millim.* ♂ ♀.

Two examples. Found also in South-eastern Borneo. The genus *Simous* was separated from *Oodes* by Chaudoir chiefly on account of the extremely short six-punctate labrum and the setiferous puncture close to the hind angles of the thorax. It forms a perfectly natural group, of which five species are now known, peculiar to Indo-China and the neighbouring islands.

Colpodes fryi.

Species magna elongataque C. parallelo (*Chaud.*) *affinis. Valde elongatus relative angustus, elytris lateribus parum rotundatis; nigro-æneus, elytris lætius cuprascenti-æneis: capite pone oculos gradatim recte angustato, collo supra transversim depresso: thorace subquadrato, capite paullo angustiore, lateribus paullo ante medium leviter rotundatis versus basin sinuatis, angulis posticis obtusis, margine anguste explanato-reflexo: elytris simpliciter acute striatis, interstitiis usque ad apicem planis, 3us punctis magnis tribus, versus apicem oblique sinuatis, juxta suturam breviter sinuato-truncatis et utrinque bidentatis: tarsis robustis, subtus dense pilosis, 4 posterioribus supra valde bisulcatis medioque carinatis, articulo 4to extus lobato. Palpi, antennæ et pedes rufescenti-picei. Long.* 17 *millim.* ♀.

One (female) example. The species belongs to the numerous group of the genus distributed through South-eastern Asia and its islands, in which the metathoracic epimera are long and narrow, the fourth joint of the hinder tarsi strongly unilobular, and the sutural apex of the elytra briefly truncated and more or less spined or toothed.

Euplynes auro-cinctus.

Breviter oblongus, subdepressus, piceo-niger, politus; elytris splendide viridi-æneis, lateribus late auratis; antennis (scapo obscuriore), mandibulis et palpis apice tarsisque rufescentibus: capite brevi mox pone oculos magnos subito angustato, supra planato lævi, sulcis frontalibus flexuosis postice versus oculos curvatis: thorace lato et brevi, angulis anticis rotundatis, posticis fere rectis, lateribus medio rotundatis postice usque ad angulum leviter sinuatis, margine basali utrinque ad angulum ascendenti, foveis basalibus latis sat profundis punctulatis: elytris humeris valde rotundatis, apice sinuatis, versus suturam conjunctim obtuse rotundatis, acute punctulato-striatis, interstitiis planis, striis 3^a^–7ma versus basin

valde curvatis, ibique interstitio 5° fovea magna oblonga. Tarsi subtus dense pilosi, articulo 4° (sicut in Euplyni) *longe bilobato. Long. 8 millim.*

This interesting species has also been met with in Sumatra by Dr. Beccari.

Dinopelma, nov. gen.

Genus anomalum, facie Platyni *vel* Colpodis *sed tarsis sicut in* Hexagonia; *subfam.* Ctenodactylinæ *referendum. Caput subovatum, post oculos rectilineatim oblique angustatum, foveis frontalibus maximis fundo inæqualibus, collo sat angusto supra transverse depresso; mandibula elongata sat recta robusta; maxillæ* (?); *mentum medio late obtuse dentatum, lobis latis extus et apice rotundatis; ligula cornea, antice lata integra bisetosa, paraglossis tenuibus liberis; palpi* (*desunt*); *labrum recte truncatum. Antennæ mediocres, articulis 3°–10^m^ subæqualibus, 1°–3^m^ et 4^ti^ basi glabris. Thorax capite multo latior, quadratus, angulis anticis obtusissimis posticis rectis, lateribus explanato-reflexis, ante medium perparum rotundatis et postice leviter sinuatis. Elytra thorace plusquam duplo latiora, oblongo-ovata, basi utrinque emarginata, humeris acutis et mox pone humeros rotundato-dilatatis deinde margine sat explanato, prope apicem valde emarginato, ibique epipleuris margine inferiore sicut in* Pterostichinæ, Ctenodactylinæ *et* Hexagoniinæ *interrupto. Tibiæ pluricarinatæ. Tarsi breves, maxime dilatati, subtus dense breviter pilosi, articulo 1mo magno triangulari angulis rotundatis, 2^ndo^ breviore, paullo latiore angulis acutis, 3^io^ multo angustiore, brevissimo, 4to iterum latiore, triangulari haud bilobato. Ungues simplices. Metathoracis episterna elongata, angusta.*

Dinopelma plantigradum.

Nigrum politissimum, elytris vix æneseentibus; capite lævi, epistomate 4-foveato; thorace impunctato, foveis basalibus prope angulos posticos latis sat profundis, sulculo abbreviato intra marginem lateralem; elytris paullo convexis, striis acutis et crenulatis utrinque novem æqualiter distantibus et impressis, interstitiis planis, 3^io^ tripunctato, striola scutellari mediocriter elongata. Long. 12 millim.

One example, apparently a female. The form of the tarsi, and especially the dilated and entire fourth joint, resembles still more closely that of the genus *Calophæna*; and in spite of the latter belonging to the *Truncatipennes* division of the Carabidæ, there may be a real affinity between the two genera.

Fam. Cetoniidæ.

Prigenia viridiaurata.

♀. *Quoad formam* P. vollenhoveni (*Mohn.*) *simillima, differt colore supra et subtus viridi-aurato, tibiis tarsisque igneo-cupreis: sat nitida, supra glabra, capite grossissime crebre punctato, vertice*

profunde concavo, fronte carina lata obtusa antice declive et postice verticaliter truncata : thorace punctis umbilicatis annuliformibus medio distantibus, lateribus densis et subconfluentibus, linea dorsali areaque basali impunctatis : scutello subtilissime striguloso-punctulato : elytris planatis, paullo subtilius quam thorace annulato-punctatis, lateribus post medium apiceque dense strigulosis : pygidium strigis concentricis densissime impressum, erecte fulvo-pilosum : corpore subtus pedibusque (lateribus densius) fulvo-pilosis. Long. 26 *millim.*

Although the female only is in the collection and of that a single example, the differences in colour and sculpture from the same sex in *P. vollenhoveni* seem to indicate a distinct species and to justify its description as such.

MYCTERISTES (THEODOSIA) TELIFER.

Elongato-oblongus, aurescenti-viridis, elytris planatis flavescentibus.

♂. *Caput et thorax passim densissime confluenter punctulata subopaca, hoc dorso subnitens punctulis subdiscretis ; scutello et elytris, pygidio, corpore subtus et pedibus subtilissime dense punctulatis, serieeo-nitentibus : capite cornu sat brevi curvato, apice profunde bifido parum dilatato, frontis margine supra antennarum basin angulatim producto ; thorace dorso oblique valde elevato et in cornu porrectum elongatum robustum apice emarginatum (subbifidum) producto ; cornu dimidio apicali fronteque igneo-cupreis : pedibus anticis, præcipue tarsis, valde elongatis, tibiis extus acute et breviter bidentatis (apicali incluso), tarsis glabris.*

♀. *Caput densissime ruguloso-punctatum, clypeo sparsim grosse punctato, margine ante oculum indentato deinde antice flexuoso, clypeo angustato apice bidentato : thorace disco sparsim grosse umbilicato-punctato inter puncta subtilissime punctulato, lateribus densissime rugoso-punctato : scutello punctis nonnullis grossis : elytris punctis umbilicatis, versus basin seriatis, versus latera et postice densius vel confusis : pygidio concentricaliter dense strigoso : tibiis anticis tridentatis. Long.* 20–28 *millim.*

According to the practice of recent systematists a new genus should be instituted for this species on account of the peculiar shape of the horns in the male ; but the abrupt modifications in these features presented in the known species allied to *Mycteristes* seem to show that they form specific and not generic characters, just as they do in such genera as *Onthophagus*, *Phanæus*, and *Copris*. Of the numerous genera proposed, the present species approaches nearest to *Theodosia*, Thoms.

CORYPHOCERA BORNEENSIS, Wall. Tr. Ent. Soc. (3) iv. p. 528, t. xi. f. 2 (♀).

One (male) example, which I refer to this species on account of its perfect agreement, in form and colour, with Wallace's description and figure. From the armature of the head of the male the species belongs undoubtedly to the genus *Coryphocera* and not to *Diceros*, as Mohnike supposed would be found to be the case when the male was known.

XENOLOBA, nov. gen.

s inter subfam. Gymnetinæ *et* Macronotinæ *collocandum.*
rpus postice gradatim angustatum, supra deplanatum, velutino-
acum. Clypeus antice sensim dilatatus, apice medio anguste
uato angulisque late rotundatis; fronte medio obtuse carinata.
tennæ clava valde elongata. Palpi elongati, gracillimi.
orax trapezoideus, sed ad basin elytris multo angustior mar-
eque laterali ante basin breviter sinuato: supra æqualis
co postice vix lineatim impresso, lobo basali magno postice
angustato apiceque late rotundato. Scutellum mediocre, apice
utum. Elytra sicut in Macronotis *ad humeros dilatata deinde*
que ad apicem angustata abdominisque latera haud tegentia.
ocessus sternalis sat elongatus, paullo oblique dependens, sub-
npressus, apice superiore paulo acuto. Tibiæ anticæ acute
dentatæ, posticæ extus læves apice longe bispinosæ.

very beautiful Cetonid which constitutes this genus connects e measure the two large groups *Gymnetinæ* and *Macronotinæ*. orax is nearly evenly convex, and its posterior lobe and its s to the scutellum are not widely different from the same in us *Desicasta*.

OLOBA SPECIOSA.

rate viridis, sericeo-opaca, elytris fulvis plaga magna communi
ilobata (utrinque albo trimaculata) fere nigra: capite antice
vo-metallico glabro grosse punctato, postice viridi-velutino,
ttis duabus flavo-tomentosis: thorace sparse setifero-punctato
marginato, sed lateribus antice intra marginem depressiusculis
flavo-tomentosis: elytris utrinque haud profunde bisulcatis,
lcis interiore tri- exteriore subtiliter bi-striatis striaque simili
turali, alteris 2–3 propinquis, versus apicem. Pygidium longe
ecte pilosum, nigrum, opacum, utrinque macula magna ochracea.
edes fulvo-testacei, æneo-tincti. Subtus viridi-velutina, erecte
lvo-pilosa, abdomine utrinque fasciis 4, metasterno fasciis 2,
isternis anterioribus et maculis variis, ochraceis. Long. 18
llim.

examples.

LCOTHEA (PLECTRONE) AURIPES, Westw. Tr. Ent. Soc. 1874, t. vii. fig. 2 (♀); Ritsema, Midden-Sumatra, Col. t. ii. figs. 6, , 6*d*′, 6*e*′ (♀).

A fœmina differt solum tibiis anticis angustis extus inermibus,
termediis intus medio incurvatis, posticis intus usque post
edium dilatatis, ibique subito angustatis et lobo acutissimo
ciformi armatis; ventro medio depresso, apice impunctato.

female only was known to Westwood and Ritsema. Our les agree exactly with the characters given by the latter to uish the species from *C. virens*, which was also apparently only in the female. I find the inner spur of the hind tibia nale only a little obtuse at the apex, not obtusely truncated as by Ritsema.

CHALCOTHEA (PLECTRONE) VIRIDIPES.

P. auripedi *quoad formam simillima. Supra cum antennis et palpis saturate viridis submetallica, subtus pedibusque subæneo-viridis: clypeo profunde fisso, capite utrinque marginato et punctato: thorace lateribus punctatis et marginatis ante medium perparum angulatis deinde usque ad angulos posticos acutis fere rectis, medio cum scutello et elytrorum sutura late depresso: elytris prope marginem et apicem punctulatis sub callo apicali strigulosis. Processus mesosternalis æquilaterali-triangularis.*

♂. *Tibiæ anticæ graciles, extus inermes; posticæ intus longe ante medium lobum elongatum tenuem apice triangulariter spathulatum emittentes. Ventris segmentum apicale apice medio emarginatum. Pygidium transversim striatulum, apice convexum medio sulcatum.*

♀. *Tibiæ anticæ latæ, tridentatæ; postice inermes, calcari interiore elongato apice emarginato. Ventris segmentum apicale semicirculare, toto transversim striolatum. Pygidium striatum, apice parum convexum, æquale. Long.* 34 *millim.*

This species is similar in colour to *Clerota brama* (Gestro), which I should have been inclined to refer it, if the mesosternal process had not been so different in form. In *C. brama* it is prolonged (as figured in 'Midden-Sumatra,' iv. 6, pl. ii. fig. 5*b*) into an acute point; in *C. viridipes* it forms a rather short subequilateral triangle. The hind legs and tarsi, judging from the figure, are also much shorter in *C. brama* than in *C. viridipes*.

CHALCOTHEA (PLECTRONE) SPATHULIFERA.

Præcedentibus differt thorace scutello basique elytrorum parum depressis his post medium planis: supra saturate ænescenti-viridis, antennis et palpis castaneo-cupreis clava obscura, corpore subtus femoribusque cupreo-auratis, tibiis, tarsis clypeoque apice igneo-cupreis; supra toto sat dense punctata, elytris bini sparsius et seriatim, lateribus et apice confluenter et rugose, punctatis, interstitiis subtilissime punctatis. Oculi magni et prominentes, capite ante oculos angusto antice dilatato, clypeo triangulariter emarginato lobisque minus acuminatis, toto crebre punctato carinisque submarginalibus angustis. Thorax angustior longe ante medium subangulato, deinde postice margine usque ad angulos posticos acutos valde sinuato: scutello lævi: elytris disco utrinque vix convexis. Subtus et pedes sat dense punctata, medio fere lævis. Pygidium dense transversim rugulatum. Processus mesosternalis mediocris, apice obtuse acuminatus.

♂. *Tibiæ anticæ extus inermes, intermediæ intus valde sinuatæ apiceque dilatatæ, posticæ intus longe ante medium lobo longissimo tenui apice spathuliformi (ovato) armatis: venter disperse punctulatus parum depressus, segmento apicali apice valde et late sinuato. Pygidium apice breviter bilobatum.*

♀. *Tibiæ anticæ tridentatæ, intermediæ rectæ calcaribus acutis, posticæ rectæ, calcari interiore elongato, apice emarginato.*

Pygidium apice planum. Ventris segmentum apicale apice obtuse rotundatum, strigosum. Long. 32 *millim.*

Chalcothea affinis, Vollenh. Tijdschr. Nederl. Ent. Ver. i. 23, t. ii. fig. 2 (♂).

Mr. Whitehead obtained female examples only, in which the esosternal process is extremely short and far from semicircular as scribed by Vollenhoven. I have, however, seen another example ♀), from Borneo (probably Sarawak), differing in no other respect om these two than in the mesosternal process being nearly semi-cular. The sides of the thorax are immarginate.

Chalcothea pomacea.

♀. C. resplendenti *quoad formam similis, paullo robustior, toto pomaceo-viridis subargenteo-relucens, subtus medio tantum subflavescens, tarsis chalybeis; supra medio fere a collo usque apicem latius et profundius quam in* C. resplendente *concava; supra et subtus lævissima, capite thoracisque lateribus parce punctatis, elytrisque prope marginem et apicem plagis duabus strigosis, callo humerali valde convexo nigro, callo apicali parum elevato: capite elongato, angusto, antice parum dilatato, apice triangulariter fisso: thorace elongato et angusto, ante medium perparum et haud angulatim dilatato, postice minus oblique sinuato-dilatato, angulis posticis perparum extus productis, margine laterali integro. Processus mesosternalis brevis, rotundato-subacuminatus vel semiovatus. Ventris segmentum apicale apice medio obtuse rotundatum, strigulatum et setifero-punctatum. Tibiæ posticæ calcari interiore apice oblique truncato. Long.* 30 *millim.*

A single female example. May possibly be found to belong to e section *Plectrone* when the male is known. The margined sides the thorax would bring it, like the following, within the definition Ritsema's genus *Pseudochalcothea*, which appears to be synonymous th *Plectrone*, all the species of which that I have seen have the orax similarly margined.

Chalcothea planiuscula.

♀. *Dilutius pomaceo-viridis, submetallico-nitens, capite viridi-æneo, antennis palpisque rufis, tibiis et tarsis fulvis læte aureo- vel cupreo-metallicis: capite ante oculos sat brevi, quadrato, apice minus angulatim profunde emarginato, passim punctato; thorace, scutello et elytris medio late et parum profunde depressis, his longe ante apicem fere planis; thorace anguste trapezoidali, angulis posticis parum productis, lateribus paullulum flexuosis fere rectis, sulco marginali profundo passim minutissime dense punctulato, punctis paullo majoribus consperso, lobo basali minus producto, scutelloque elongato: elytris lateribus et apice sat dense punctatis, disco utrinque convexo lævi. Pygidium dense transversim striatum. Processus mesosternalis brevissimus, antice rotundatus. Subtus medio lævis, lateribus et pedibus disperse punctatis. Ventris*

segmentum apicale strigulosum, apice rotundatum. Tibiæ posticæ calcari interiore apice emarginato-truncato. Long. 30 *millim.*

A single (female) example.

GLYPTOTHEA, nov. gen.

A gen. Chalcothea *differt clypeo apice verticaliter reflexo integro. Oblongus; thorace postice, scutello elytrisque medio profunde depressis, his disco posteriore lateribusque plurisulcatis: tibiæ 4 posticæ calcaribus longitudine valde inæqualibus. Antennarum clava cæteris articulis conjunctis dimidio longior. Processus mesosternalis brevis, apice rotundatus.* ♂.

GLYPTOTHEA WHITEHEADI.

♂. *Supra obscure viridescenti-fulva, elytrorum lateribus obscure viridi-æneis, capite et tibiis viridi-æneis, tarsis chalybeis, corpore subtus femoribusque splendide auratis, antennis castaneis scapo viridi-æneo: capite grosse sparsim punctato, ante oculos oblongo, lateribus elevatis obtusis: thorace anguste trapezoidali, longe ante medium paullulum angulato-dilatato, deinde usque ad basin parum ampliato, lateribus leviter sinuatis, angulis posticis paullulum productis subacutis, lateribus ante dilatationem deflexis immarginatis, post dilatationem marginatis, lobo basali mediocriter producto, supra passim discrete punctato: scutello elongato, lateribus postice sinuatis: elytris utrinque disco convexo, versus basin lævi post medium in costas duas læves diviso, costaque 3ª lævi submarginali, interstitiis depressis punctato- vel rugulosostriatis: pygidio convexo, dense et profunde transversim striato, medio postice sulcato. Subtus fere lævis, segmento apicali apice late sinuato. . Tibiæ anticæ extus inermes, 4 posticæ apice valde inæqualiter bidentatæ, calcaribus longitudine inæqualibus, posticarum calcari interiore elongatissimo unciformi. Long.* 19 *millim.*

A single (male) example.

TÆNIODERA DITISSIMA.

In hoc genere magna et robusta; supra nigra, opaca, capite vitta duabus latis, thorace utrinque vitta lata laterali postice angustata et ante basin terminata; scapulis, scutello (et margine elytrorum contiguo) elytrisque guttulis lineolisque transversis, ochraceo-tomentosis, disco elytrorum utrinque macula elongata alteraque humerali purpureo-sanguineis; subtus ochraceo-tomentosa (ventre pallidiore) et pilosa, medio anguste nigro-ænea, polita, abdominisque segmentis dorsalibus ad marginem singulis macula magna sericeo-nigra; pygidio nigro, macula mediana ochraceo-tomentosa. Clypeus grosse punctatus, glaber, apice sat profunde emarginatus. Thorax sicut in T. egregia, postice lateribus paralleliis angulisque posticis paullo obtusis, lobo mediano mediocriter producto late rotundato, dorso æquali disperse curvatim strigulosa, lateribus tomentosis undulato-strigulosis. Scutellum elongato-triangulare. Elytra medio late depressa, in depressione postice striis 5 undulatis, disco utrinque longitudinaliter elevato obtuse unicarinato,

limbo transversim rugulato. Pedes nigro-nitidi, femoribus anticis ochraceis, tibiis 4 posticis extus medio unispinosis. Processus mesosternalis tuberculiformis.

♂? *Tibiæ anticæ acute tridentatæ; intermediæ rectæ, apice extus unispinosæ; posticæ apice extus sat longe lamiuato-productæ, laminæ apice recurvato dilatato angulisque dentatis, calcari interiore curvato et late ensiformi. Long.* 20 *millim.*

Two examples of the same sex, apparently males.

Longicornia.

Kinibalua, nov. gen.

♂. *Gen.* Doryceræ (*White*) *et* Ommatomeno (*Higgins*) *proxime affinis. Corpus mediocriter elongatum, subtiliter sericeo-pubescens. Oculi maximi, supra fere contigui (linea impressa solum separati), subtus approximati. Mandibulæ sicut in* Dorycera, *sed apice subito curvatæ; palpi articulo apicali cylindroido, obtuse truncato. Antennæ corpori longitudine subæquales, scapo curvato-clavato, articulis 3°–9ᵐ (cæteris desunt) valde compressis, angulis apicalibus acutis intus productis, subtus planis opacis, supra intus paullo dilatatis ibique late haud profunde sulcatis, subtiliter porosis, opacis. Thorax latissimus et brevissimus, utrinque valde tridentatus, dentibus 2 anterioribus basi conjunctis, 2ᵒ retrorsum curvato. Elytra lateribus paullulum rotundatis. Tibiæ sat tenues, compressæ, apice extus acutæ productæ. Prosternum apice parum productum, conicum. Metasterni episterna postice haud angustata.*

The only Malayan genus of Prionidæ of the subgroup to which the present species belongs is *Emphiesmenus* (Lansberge), founded on a Sumatran species, and differing from *Kinibalua* essentially in the structure of the antennæ, which in our genus closely resembles that of the West-African genera *Dorycera* and *Ommatomenus*. In these latter, however, the scape is quite different in form, being very short, thick, quadrate (subglobular in *Dorycera*), as in *Acanthophorus*, whilst that of our new genus is more elongate and curved. In this respect it resembles the South Chinese genus *Cnethocerus*, belonging to the same subgroup.

Kinibalua megalops.

Cinnamomeo-fusca, supra dense breviter fulvo-pubescens, pectore densius et longius vulpino-rufo piloso; thorace supra inæquali; elytris subtiliter crebre punctulatis, lateribus longitudinaliter parum distincte sulcatis, apice late rotundatis, angulo suturali breviter dentiformi; ventro glabro, polito. Long. 30 *millim.* ♂.

A single (male) example.

Zonopterus magnificus.

Nigro-velutinus, elytris fascia lata flava, antennis articulis 4°–11ᵐ et 3° apice aurantiaco-flavis, abdomine chalybeo-nigro, segmentis 1°–4ᵐ apice fascia pubescenti argentea ornatis, coxis

metasternoque apice argenteo-maculatis. Antennæ dimidio corporis fere æquales: thorax antice et postice constrictus, medio transversim quadratus et convexus: elytra basi thorace fere duplo latiora, postice gradatim leviter angustata, costis utrinque tenuissimis et parum elevatis duabus, fascia flava nuda sed opaca vage rugosa: tibiæ posticæ subrectæ, compressæ, gradatim leviter dilatatæ. Long. 37 millim. ♀.

A single example.

GAURESTHES, nov. gen.

Gen. Helymæo (*Thoms.*) *affinis. Corpus elongatum, elytris supra subplanatis, post medium paullo dehiscentibus. Caput antice sat elongatum, mandibulæ elongatæ, rectæ; maxillæ exsertæ. Antennæ* (♂?) *dimidio corporis paullo longiore, ante apicem sensim gradatim incrassatæ, articulis 8°–11^m^ iterum angustatis, ultimo [illegible] curvato articulo 3° valde elongato. Thorax breviter subcylindricus, lateribus utrinque tuberculo lato conico. Elytra thorace dimidio latiora elongata fere parallela, apice latissime rotundata, supra utrinque tenuiter bicostulata. Femora clava[illegible]a, postica elongata (elytrorum apicem perparum longiora); tibiæ posticæ post medium paullulum curvatæ compressæ, mediocriter dilatatæ; tarsi articulo basali duobus sequentibus conjunctis subæquali. Scutellum apice acutum, prolongatum.*

Among the few genera of *Callichrominæ* with clavate and petiolated femora this new form approaches the African and Arabian *Helymæus* much nearer than the Malayan *Ipothalia*. It differs from *Helymæus* in the three apical joints of the antennæ being gradually narrower with the terminal one obtusely acuminated, in the long straight mandibles, and in the different form and punctuation of the thorax.

GAURESTHES RUFIPES.

Nigro-violaceus, subnitidus, cum plagis opacis, pedibus (tibiis posticis cyaneo-violaceis exceptis) rufis: thorace disco antico basique medio impunctato polito, cætera superficie creberrime subtiliter scabrosa et nigro-opaca, lateribus argenteo-sericeis: scutello subtiliter scabroso viridescente opaco, linea media polita: elytris subtilissime punctulato-scabrosis, opacis, sicut velutinis, humeris fasciaque lata ante-mediana sparsius punctato-scabrosis, subnitidis: subtus chalybeus, argenteo-sericeus. Long. 28 millim. ♂?

One example only.

EUSYNTHETA, nov. gen.

Gen. Achthophoræ *certe affinis, sed valde differt antennis brevibus, robustis, articulis 4°–11^m^ brevissimis. Breviter oblongo-ovata. Frons trapezoidalis, oculis nullo modo prominentibus. Tubera antenniferi approximati, paullulum divergentes nec armati. Antennæ* (♀?) *robusti, capite cum thorace paullo longiores, subtus sparsim breviter ciliatæ; scapo elongato-conico, cicatrice*

scabrosa incompleta, articulo 3to quam scapo dimidio bre-e, 4to adhuc breviore, cæteris brevissimis. Thorax post ium tuberculo acuto armatus. Elytra thorace fere duplo ora, absque cristis, apice rotundata. Mesosternum pro-tum, conicum. Tibiæ intermediæ extus oblique sulcatæ. ques parum divaricati.

ncompleteness of the ridge limiting the cicatrice of the scape fact, very short) would remove this genus from the group *Achthophora* belongs, but in all its other characters it agrees group. The claws in three species of *Achthophora* which xamined are as feebly divaricated as in the new genus.

NTHETA BREVICORNIS.

fuligineo-nigra, vertice vittis duabus latis, thorace lineis bus dorsalibus, scutello, elytris fascia lata mediana et macula gna apicali, cinereo-albo tomentosis: antennis articulis nullis basi, fronte genisque, corpore subtus et pedibus ereis. Thorax grosse ruguloso-punctatus. Elytra basi e grosse et aspere, versus apicem sparsim grosse, punctata. ng. 16–20 *millim.*

examples—two in Mr. Fry's collection.

November 5, 1889.

. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Secretary read the following reports on the additions made ociety's Menagerie during the months of June, July, August, tember, 1889:—

otal number of registered additions to the Society's Mena-ring the month of June was 100, of which 18 were by birth, resentation, 19 by purchase, 3 by exchange, and 7 were on deposit. The total number of departures during the riod by death and removals was 111.

ngst these is a fine male specimen of the Cocoa-nut Land-the East Indies (*Birgus latro*), presented by Commander Carpenter, R.N., and received June 14th.

Crab, which has been placed in the Insect-house, feeds well able-marrow and other fruits. It is the first specimen received nteresting species [1].

registered additions to the Society's Menagerie during the f July were 152 in number; of these 55 were acquired by tion, 39 by purchase, 4 by exchange, 42 by birth, and 12 eived on deposit. The total number of departures during e period by death and removals was 117.

ng these special attention may be called to the following:—

Short Python (*Python curtus*), from Malacca, presented d by Mrs. Bertha M. L. Bonsor; new to the Collection.

[1] See notice in the 'Field' of July 13th, 1889 (vol. lxxiv. p. 45).

2. A Prêtre's Amazon (*Chrysotis prætrii*), purchased July 23rd; also new to the Collection.

The registered additions to the Society's Menagerie during the month of August were 117; of these 63 were acquired by presentation, 6 by purchase, 6 by birth, 1 by exchange, and 41 were received on deposit. The total number of departures during the same period by death and removals was 96.

The registered additions to the Society's Menagerie during the month of September were 84; of these 34 were acquired by presentation, 22 by purchase, 4 by exchange, 10 were bred in the Gardens, and 14 were received on deposit. The total number of departures during the same period by death and removals was 78.

Prof. F. Jeffrey Bell, F.Z.S., exhibited and made remarks on two specimens of *Virgularia mirabilis*, dredged up by the Hon. A. E. Gathorne Hardy, M.P., in Loch Craigrush; also two young living specimens of *Palinurus vulgaris*, received from Mr. Spencer of Guernsey, and a fresh specimen of *Galathea strigosa*, also received from Mr. Spencer. The mode of stridulating of the *Palinurus* was observable in the specimens.

Mr. J. H. Gurney, jun., F.Z.S., exhibited a specimen of a hybrid Wagtail, between *Motacilla melanope* and *M. lugubris*, one of three bred some years ago in Mr. T. J. Monk's aviary at Lewes in Sussex (being the same as those mentioned in the 'Zoologist' for 1885, p. 24), and made some remarks on the probability of various Wagtails, closely allied, interbreeding in a wild state.

Mr. W. B. Tegetmeier, F.Z.S., exhibited and made remarks on some specimens illustrative of variations in the plumage of the Common Partridge (*Perdix cinerea*).

A communication was read from the Rev. Thomas R. R. Stebbing on *Urothoë*, a genus of Amphipodous Crustaceans, and on a new allied genus, proposed to be called *Urothoides*, of which *Urothoë lachnessa*, Stebbing, was the type.

This Memoir will be printed in the Society's 'Transactions.'

The following papers were read:—

1. List of Birds collected by Mr. Ramage in St. Lucia, West Indies. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received July 25, 1889.]

The series of birds collected in St. Lucia by Mr. George A. Ramage, the naturalist employed by the joint Committee of the Royal Society and the British Association for the investigation of

nd flora of the Lesser Antilles, consists of 96 specimens, er to the following species[1]:—

rminia sanctæ-luciæ, *Scl.*
ps densirostris (*Vieill.*).
ntanus (*Lafr.*).
ocinclus brachyurus .).
rthia macrorhyncha, *Scl.*
es sanctæ-luciæ, *Steju.*
orus mesoleucus, *Scl.*
a delicata, *Sharpe.*
a semperi, *Scl.*
s ruticilla (*Linn.*).
s martinicana, *Reichenb.*
a flavifrons (*Sparrm.*).
noctis (*Linn.*).
ra bicolor (*Linn.*).
audabilis, *Scl.*

16. Quiscalus inflexirostris, *Sw.*
17. Elainea martinica (*Linn.*).
18. Contopus latirostris (*Verr.*).
19. Myiarchus tyrannulus (*Bodd.*).
20. Eulampis jugularis (*Linn.*).
21. —— holosericeus (*Linn.*).
22. Bellona cristata (*Linn.*).
23. Crotophaga ani (*Linn.*).
24. Coccyzus minor (*Gm.*).
25. Buteo pennsylvanicus (*Wils.*).
26. Falco caribbæarum, *Gm.*
27. Columba corensis, *Gm.*
28. Chamæpelia passerina (*Linn.*).
29. Geotrygon montana (*Linn.*).
30. Nyctiardea violacea (*Linn.*).

s of St. Lucia are principally known from the collections hes of our Corresponding Member the Rev. J. E. Semper, in our 'Proceedings'[2]. Mr. Ramage's collection makes s to the list, but supplies an acceptable contribution to of West-Indian specimens in the National Collection, will be deposited.

ies at present known as absolutely restricted to St. Lucia nine in number. These are:—

Cichlherminia sanctæ-luciæ, Scl.
Cinclocerthia macrorhyncha, Scl.
Myiadestes sanctæ-luciæ, Steju.
Thryothorus mesoleucus, Scl.
Dendræca delicata, Sharpe.
Leucopeza semperi, Scl.
Ieterus laudabilis, Scl.
Contopus latirostris (Verr.).
Chrysotis versicolor (Müll.).

(Bull. Nutt. Orn. Cl. v. p. 166) has also separated *a noctis* of St. Lucia as a subspecies (*sclateri*), but the elied on do not seem to be constant.

nparisons should also be made of *Cichlherminia sanctæ-adestes sanctæ-luciæ*, and *Dendræca delicata* with om the adjoining islands, as the three species have not y definitely characterized.

[1] of Mr. Ramage's collection from Dominica, see *supra*, p. 326.
[2] S. 1871, p. 263, 1872, p. 647, and 1876, p. 14.

2. On New Indian Lepidoptera, chiefly Heterocera.

By Col. C. Swinhoe, F.L.S., F.Z.S.

[Received July 23, 1889.]

(Plates XLIII. & XLIV.)

At the request of the Trustees of the Indian Museum, Calcutta, Mr. E. C. Cotes and I have made a catalogue of the Moths of India, which has been lately published.

As I have had to do the work of classification, it has been my good fortune to have had the examination of the collections of the Indian Museum, Calcutta, and of the Phayre Museum, Rangoon, entrusted to me, as also of private collections from many parts of the Indian Region, which Mr. Hampson, Mr. Wise, Major Yerbury, and others have very kindly placed at my disposal.

In comparing these with my own large collection of moths I have found many new and unrecorded species, some of which I now describe. Along with these are characterized a few new butterflies, the manuscript descriptions of which have been ready for some time, waiting an opportunity for publication.

I have, as usual, presented types of all the species herein described to the British Museum.

RHOPALOCERA.

Nymphalidæ.

Satyrinæ.

Ypthima jocularia, n. sp.

Male and *female*. Above and below as in *Y. huebneri*, but the hind wing above has a suffused submarginal whitish band attenuated at both ends, making this species a link between *Y. huebneri* and *Y. ceylonica*, which has the lower half of the hind wing above pure white.

Expanse of wings, ♂ $1\frac{4}{10}$, ♀ $1\frac{6}{10}$ inch.

Hab. Mahableshwar, April and May 1887. Thirty-one examples taken.

Nymphalinæ.

Cynthia saloma, n. sp.

Male. Dull ochreous, basal area and marginal border darker, densely irrorated with reddish grey with a greenish tinge; markings as in *C. asela*, but the coloration is altogether different, and the band between the medial line and the outer border is much paler than either in *C. erota* or in *C. asela*, giving it the appearance of a dull pale whitish greyish-ochreous band, which gradually darkens on the lower half of the hind wing and becomes suffused into the darker colour of the marginal border.

side as in *C. asela*, but paler; coloration duller and less and without the small brown patch at the hinder angle.
. Dark greenish grey, outer border dark chocolate-grey: s with the cell-markings as in *C. erota* female; a central e followed by a broad white band divided by the veins, and narrowest on the hinder margin, where the outer half of is greenish, and it expands upwards to the costa to within ch of the apex, a suffused black spot on the lower radial e, a dentated black line running through the band near its rgin; a white subapical spot, and two very slight, sinuous, bmarginal lines, very nearly straight and not together as is *C. erota* and *C. asela*.
ving with a central faint brown line in continuation of the e fore wing, followed by a broad band, also in continuation nd on the fore wing; but this band, instead of being white, h grey, only slightly paler than the coloration of the basal is quite as opaque as the rest of the wing, instead of being ine as is the case in the allied species; there are also the l discal ocelli and two submarginal black lines.
side as in *C. erota* female, but the band on the hind wing f being white is greyish ochreous, and very slightly paler coloration of the outer border.
se of wings, ♂ $3\frac{7}{10}$, ♀ $4\frac{7}{10}$ inches.
Nilgiri Hills, two pairs, received from Mr. Hampson; North two pairs, received from Mr. Wise; also recorded from and Travancore in Marshall and de Nicéville's 'Butterflies' vol. ii. p. 43.

LYCÆNIDÆ.

OPHANUS SUSANUS, n. sp.

to *C. phœnicurus*, Lederer.
smoky brown, with the copper colour showing through: s paler than the hind wings, and of a more copper hue, gs darker towards the base; the few markings in the wings used by the markings below showing through the wing; s with three spots in the cell in a line, one being at each one in the middle; costal margin and hinder margin deeper nd a band of the same colour on the outer margin.
wing with a faint submarginal band of reddish, clearer he anal angle; tail as in *C. phlæas*, but long and produced ir streak.
white, with a brown centre; collar white; eyes and body antennæ brown, with white bands.
side coloured and marked somewhat as in *C. pavana*, all and lines black surrounded with whitish: fore wing pale llow, fading to whitish at the base, three spots in a line in one in the interspace below, just underneath the centre cell- arginal line black, a submarginal macular band with a nacular line between, but not reaching the hinder margin,

and a discal corresponding row of spots smaller than the submarginal row.

Hind wing coloured and marked almost exactly as in *C. pavana*; two spots at the end of the cell, and five rows of spots and macular lines on the wing, subbasal row consisting of two spots, antemedial row of four spots almost in a line, passing just inside the two spots at the end of the cell; a curved row of discal spots, a submarginal macular line, a band of white between these rows, another macular line close to the border line, which is also black, with a red band between.

Expanse of wings 1 inch.

Hab. Gunduk, Beloochistan (June 1885). One pair.

Papilionidæ.

Pierinæ.

Huphina nama, var. andamana, n. subsp.

Smaller than typical *H. nama*; the male is similarly coloured and marked above: below, in each of the six specimens before me, the cell in the hind wings is not clear pale yellow as in typical *H. nama*, more than two thirds of it from the base being filled up with the greenish coloration of the rest of the wing; the pale yellowish streak which usually runs from the base right through the cell near to the outer margin in this subspecies merely consists of a large patch occupying the outer third of the cell and a small space beyond.

The female, however, is entirely unlike the female of typical *H. nama*; it nearly resembles its male, but the apical band on the fore wings above and below is much deeper; the marginal band on the hind wing above is also broader and darker, and the costal border and basal portion of both wings are broadly irrorated with blackish-brown atoms.

Hind wing below as in the male.

Expanse of wings, ♂ $2\frac{3}{10}$, ♀ $2\frac{3}{10}$–$2\frac{5}{10}$ inches.

Hab. Andaman Islands. 8 ♂, 2 ♀, received from Mr. de Nicéville.

This is, of course, merely a curious local form of *H. nama*, but as I have never seen it from any other locality I think it is worth recording.

Appias hippoides, var. epicœna, n. subsp.

Male. Similar to the male of *A. hippoides*, but the black bands on both wings above and below are much narrower. The female, however, is altogether different, being white above like its male; fore wing with a broad, even, black, costal border, extending downwards nearly halfway into the cell; the base suffused with black, and filling nearly the basal half of the cell, and the marginal bands of both wings resembling in form the marginal bands of the male, but uniformly black and quite double the breadth: underside also as

ale, but the yellow of the hind wing is more ochreous, and
ous subapical spot of the fore wings is wanting.
e of wings, ♂ $2\frac{4}{10}$, ♀ $1\frac{8}{10}$–$2\frac{2}{10}$ inches.
Maldah, Bengal. 1 ♂, 2 ♀, received from Mr. Irvine.
a very curious local variety of *A. hippoides*.

NOLA, n. sp.

White tinged with pale saffron-yellow; base of both wings
of fore wings to the apical patch irrorated with blue-
cal patch bright orange, divided by the veins into seven
e outer and inner bands black; the outer band dentated
on the veins, and extending down the outer margin to the
vein; the inner band as usual very variable, in some
it is broad and equal, but always more or less diffuse, the
ob at the end of the cell being only distinguishable by a
ow into the orange space, in other specimens the inner band
nted by a costal patch and the square knob hardly con-
gether, and the commencement of a band from near the
ngles, like the usual inner band of a female *Ixias*; and
hese two kinds there are many intermediates.
ings with a macular border decreasing from the apex: this
y variable—in some there is hardly any band at all, merely
arginal line at the apex with marginal dots on each vein;
there is a deep black band halfway down the margin, and
rginal spots on the veins, decreasing in size to the anal
many intermediates.
fore wings coloured as above; the entire surface of the
ch pale orange; the outer band slightly showing through
or less irrorated; the inner band represented by a promi-
k square spot at the end of the cell, and a submarginal
black spots, which in some specimens have white centres;
s much darker saffron-coloured, more or less covered with
igæ, with an indistinct brown costal spot, a brown cell-spot
ite centre, and a discal whorl of five or six indistinct white
rgined with brown; the markings vary much in density in
pecimens.
Coloured and marked like the male; the orange patch is,
narrow and not so bright; the inner band disconnected
three submarginal spots in it, the border on the hind wing
and so is the general coloration above and below; the
below are also similar, but darker and more prominent.
e of wings $1\frac{9}{10}$–2 inches.
Mahableshwar (April and May, 1887). Found in great
I took several hundreds of specimens, many being females.
es is not nearly allied to any of this genus that I am ac-
with, and is very distinct.
two of the broad-banded varieties measure as much as $2\frac{3}{10}$
oss the wings in both sexes.

HETEROCERA.

BOMBYCES.

SYNTOMIDÆ.

SYNTOMIS WIMBERLEYI, n. sp. (Plate XLIII. fig.

Blackish brown; spots and markings golden yellow fore wing with a small spot subbasal, two large spot lower one the larger, and two discal, the largest of all golden yellow, with a deep costal and marginal bar attenuated to the hinder angle; front of head, sides of spots on fore and hind part of thorax, segmental bands all golden yellow; underside, wings as above, legs golden yellow, and the segmental bands of the abdom encircling it.

Expanse of wings $1\frac{2}{10}$ inch.

Hab. Andaman Islands. One perfect specimen, Mr. Wimberley.

Most nearly allied to *S. pfeifferi* from Sumatra, pattern of the yellow spots on both wings; the fore a single spot only before the apex, while the lower out posterior margin is narrow and elongated obliquely the hind wing the yellow spot extends through the c deeply indented from its outer edge to the median vei

NOTIOPTERA PROPERTA, n. sp. (Plate XLIII. fig

Deep black; antennæ long, two thirds of the leng wings; shaft glistening, pectinated from the base to t sexes, but three times broader in the male than in the wings with two bands of white hyaline streaks—firs sisting of five, the other discal, consisting of four, t broadest and more rounded.

Hind wings with a long suffused semihyaline whi streak from the base to near the apex, a central short also from the base, and two or three other faint, s streaks adjacent, and two discal hyaline spots close toge one much the larger; thorax and abdomen deep black sheen with bright gilded golden-yellow bands; but i examples before me, two males and one female, all tak month, at the same place, these bands all differ; o broad collar, a large spot in the centre of the thorax penultimate segments of the abdomen all bright gold low, with this colour running up some distance on e female has the thorax-spot absent, and the other thorax-spot and collar both absent, but in all other are identical.

Underside deep black; wings as above; proboscis

Expanse of wings $1\frac{2}{10}$ inch.

Hab. Rangoon. 2 ♂ and 1 ♀, received from Mr.

The allied *N. dolosa*, Walker, differs on the fore w

three superposed medial and two pairs of similar short discal spots; the hind wing has a single ill-defined spot.

AGARISTIDÆ.

EUSEMIA ACCURATA, n. sp.

Above black, second joint of palpi white, head with two white longitudinal stripes, thorax with three, tip of abdomen orange-yellow; fore wings with a white subbasal dot, a small white antemedial spot, a large irregular bottle-shaped white central band extending from near the costa to centre of internomedian area, and another white band postmedial, broader, extending from near costa to second median branch, straight on its inner side, angled and curved on the vein, and going slightly below it at its outer corner, and excavated on its outer side, all four white marks equidistant from each other; fringe brown, interlined, white at the apex.

Hind wings with one large round central white spot; fringe brown, with the outer half pure white.

Wings below same as above; face, thorax, and legs orange; tarsi black; abdomen with apex and two large patches on last two segments orange-coloured.

Expanse of wings $2\frac{4}{10}$ inches.

Hab. Moulmein, June 1888. One example of this distinct species in poor condition was received from Mr. Noble.

This species belongs to the section of the genus of which *E. basalis*, Walker, and *E. peshwa*, Moore, are typical, and has similarly disposed spots on the fore wings, but of a different shape: the hind wing also has a similar medial spot, but the accompanying bright yellow basal area is absent.

CHALCOSIIDÆ.

POMPELON VALENTULA, n. sp.

Wings dark brownish black, unmarked; fore wing with the costal and apical borders glistening blue.

Hind wing with the costal and outer borders pale brownish white, deepened to the anal angle, and with a glistening blue apical patch.

Below brown; fore wings with the discoidal veins blue, and a large orange-red spot inside the end of the cell; hind wings with a broad whitish border; antennæ black. Body above black, below crimson, with black spots on each side of the thorax and abdomen; legs black.

Expanse of wings $3\frac{1}{10}$ inches.

Hab. Burmah. One specimen received from Mr. Noble.

A larger species than *P. marginata*, and distinguishable from it by the brownish-white outer border to the hind wings.

NYCTHEMERIDÆ.

PTEROTHYSANUS NOBLEI, n. sp. (Plate XLIV. fig. 3.)

Male and *female*. Wings white, pattern of the markings arranged

as in *P. laticilia*, but instead of being black with white
white with black bands and is very much smaller; in the
the white spot near the base of the hinder margin and
spot near the hinder angle are enlarged, and occupy
portion of the lower half of the wing; the white space ne
in some specimens, running upwards to and joining the
at the end of the cell, leaving a blackish-brown cos
straight, and a medial transverse sinuous central band
white subapical spot or streak in *P. laticilia* is also rep
this insect by a broad subapical white band, which in
mens curves inwards, and in one it curves outwards and
fifth submarginal spot, counting from the apex.

Hind wing as in *P. laticilia*, but all the black band
much smaller; the black spot attached to the centre of
band hindwards is wanting; and, in one specimen, the
dentated black discal band is represented by a curved ser
spots; both wings with a marginal series of pink s
P. atratus, but they are round and not angular as in that
form a complete band on both wings; thorax blackish bro
collar, and abdomen orange, abdomen with a dorsal band of

Body below and legs blackish brown, abdomen with
pale yellow spots; pattern of wings below same as above.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Prome (Burmah). Four examples received from
they differ somewhat from each other, but were all take
in May 1887, and are evidently all of one variable specie

Lithosiidæ.

Hypsinæ.

Migoplastis hampsoni, n. sp. (Plate XLIII. fig. 2

Male and *female*. Antennæ, head, thorax, and wings
fawn-colour.

Hind wings of the male yellowish, head with a central
hindwards, thorax with a row of four black spots in fro
three in the centre, and two middle spots hindwards, all
with yellow; fore wings with two basal black spots, and
with the veins paler, and with a broad pale median ba
paler than the colour of the wing, but quite distinct, touch
costa nor hinder margin on the fore wings, and diffused
attenuated downwards on the hind wing; the band look
so much colour had been rubbed off the wing; cilia of
grey; abdomen above and below yellow, with a row of
down the centre and on each side.

Underside: wings as above; antennæ blackish toward
palpi black; body and legs same colour as the wings.

The male differs from the female in having the hind w
vated hindwards, forming an acute point at the anal an
having these wings suffused with yellow.

Expanse of wings $2\frac{8}{10}$ inches.

Hab. Nilgiri Hills, northern slopes 3500 feet, June 1888. Two female specimens received from Mr. Hampson, and a pair from Mr. Lindsay.

Distinguishable from the only other known species of this genus, *M. ceylonica*, by the pointed anal angle of the hind wings and by the uniform colouring of the front and hind wings in the female, whereas in the female of *M. ceylonica* the hind wings are entirely yellow.

LITHOSIINÆ.

COSSA RUMA, n. sp.

Fore wings violet-brown, with a broad marginal band of paler colour, a suffused yellowish space at the base of the wing, extending to nearly the middle of the hinder margin and occupying more than the lower half, and a large pale yellow streak in the centre of the costa; the coloration of the fore wings varies somewhat in different specimens, the yellowish basal space being sometimes absorbed into the ground-colour of the wing, and in some specimens the yellow costal streak is reduced to a large spot.

Hind wings pale greyish ochreous-yellow unmarked.

Wings below of the same colour, but slightly darker; fore wings with the central space violet-brown. Front of head, palpi, body below, and legs ochreous; antennæ and body above violet-brown; abdomen palest, and in some specimens suffused with ochreous.

Expanse of wings 1½ inch.

Hab. Mahableshwar (May 1887). Nilgiri Hills, 6700 feet (June 1887).

I have a number of examples taken by myself at Mahableshwar, and eight received from the Nilgiri Hills from Mr. Hampson.

This is a larger insect than *C. basigera*, the type of the genus, and is distinguishable from it by the fore wing having the inner pale area traversed by an outwardly oblique violet-brown fascia which extends from the base of the costa, whereas in *C. basigera* the pale basal area extends uninterrupted to the middle of the costa.

ARCTIDÆ.

PANGORA RUBELLIANA, n. sp.

Allied to *P. distorta*, Moore.

Fore wings dull slate-colour, markings pure white, a large crown-shaped patch running into the wing from the base, with two well-separated black spots in a line on its lower part, a large distorted central band, excavated on the costa, on the hinder margin of the wing and on both sides in its centre; a black spot above the outside central excavation, and a small black point above the excavation on the hinder margin; four large spots on the outer margin, one divided by the vein just below the apex; a smaller longitudinal spot just below and not touching the margin, another in the centre, also not touching the margin, and a much smaller spot on the margin just below.

Hind wings deep bright red, a bifid slate-coloured spot at the end

of the cell in the male, with a streak below of the same colour, but in the female there is only one small spot at the end of the cell and another small spot below, in place of the streak, also a broad dull slate-coloured marginal band, outwardly deeply excavated, making it appear as if composed of three patches, as much so in the female as to make the band submarginal and mandate.

Wings below same as above, except that the red of the hind wings and white of the fore wings is pale pink, the marginal spots on the fore wings being pure white. Antennæ slate-colour; head and thorax pure white, markings slate-colour, a small spot on the centre of the head, two on the collar and to the thorax, one on each division, and a band in the centre; abdomen deep bright red, extending far beyond the wings, with a complete dorsal row of dark slate-coloured spots; body below whitish, legs slate-colour, striped with pink above.

Expanse of wings 2 inches.

Hab. North Kanara, June 1887. One pair received from Mr. Wise.

Distinguishable from *P. dictorta* (the habitat of which is the N.W. Himalayas) by the markings on the fore wing being pinkish white and broader, whereas in *P. dictorta* they are yellowish white, the transverse discal band being half its width, the hind wing in the latter species being also differently marked.

Alea sara, n. sp.

Allied to *A. lactinea*, Cramer, and similarly coloured and marked; it is, however, a smaller insect, the crimson band on the costa of the fore wing is finer, and the prominent crimson band on the collar is altogether absent; the colour of the upper part of the abdomen is also orange-red, as in *A. amorei*, Butler, and not ochreous as in *A. lactinea*, Cram.

Expanse of wings. ♂ $1\frac{1}{10}$, ♀ $1\frac{4}{10}$ inch.

Hab. Karachi, August 1885, July and August 1886. Many examples taken.

A smaller insect than either *A. lactinea* or *A. sanguinolenta*, neither of which occur at Karachi.

Alea insolata, n. sp. (Plate XLIII. fig. 15.)

Allied to *A. lactinea*. Head, thorax, and wings pure white, costa of fore wings crimson; a black spot at the end of the cell, another below it, near the hinder margin, sometimes one near the hinder margin, one third from the base, and sometimes a subapical point, and sometimes a fine black subapical streak; hind wings with a black spot at the end of the cell, and otherwise unmarked, a black spot on each side of the thorax; antennæ black; abdomen above ochreous, with black short bands, little better than dorsal spots.

Below: wings as above; body white; femora crimson; tibiæ black above, ochreous below; tarsi black.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Thyetmeyo, Sept. 1887. Two males received from Mr. Noble.

A much smaller insect than *A. lactinea*, and differs from it in the absence of the scarlet front and thoracic band and in wanting the marginal black spots which are so prominent on the hind wing of that species.

SPILARCTIA UMMERA, n. sp. (Plate XLIII. fig. 1.)

Female. Dull ochreous; head, thorax, and fore wings ochreous fawn-colour, thorax with a black spot in front; fore wings above with a black spot at the base, but without any other markings; hind wings dull ochreous yellow, a black spot just above the end of the cell, and two black submarginal spots near the anal angle; abdomen ochreous, with a dorsal row of black spots, a black spot also on middle of thorax.

Wings on the underside same colour as the hind wings above, fore wings with a black subcostal spot above the end of the cell; hind wings with the three black spots as above, and with a very faint pale black subapical spot. Body below white; antennæ black; face and pectus ochreous, the latter with some black markings.

Palpi with first and last joint black, second joint ochreous; fore legs ochreous, hind legs white.

Tibiæ and tarsi above blackish.

Expanse of wings $1\frac{7}{10}$ inch.

Hab. Bassein, Burmah, Oct. 1887. One perfect specimen received from Mr. Noble. Nearest to the Javan *S. punctata*, but smaller in size; similarly coloured, but with a basal black spot on the fore wing and a spot on the middle of the thorax, these spots being absent in *S. punctata*.

TINOLIUS HYPSANA, n. sp.

Male. Fore wings dirty straw-colour, with pale yellowish buff-coloured spots placed exactly as in *T. eburneigutta*.

Hind wings and wings below pale yellowish buff-colour, unmarked; antennæ pale yellow, pectinations grey; head, body, and legs chrome-yellow, thorax with some black spots, abdomen with a black band on each segment except the basal one; legs with large lunular black spots above.

Expanse of wings $2\frac{8}{10}$ inches.

This insect has the appearance of an ordinary yellow *Hypsa*.

Hab. Sikkim. Three specimens purchased from Mr. Paul Möwis.

LIPARIDÆ.

SOMENA ABJECTA, n. sp. (Plate XLIII. fig. 13.)

Allied to *S. scintillans*.

Male and *female* of a pale dirty yellowish-buff colour, top of head whitish, abdomen brown, anal tuft ochreous; fore wings suffused with pale reddish brown and covered with black atoms; an antemedial and a postmedial, very indistinct, pale, transverse, thin band,

which curve outwardly, and are only apparent on some specimens. Underside pale greyish white tinged with flesh-colour, unmarked.

Expanse of wings, ♂ 1 inch, ♀ $1\frac{2}{10}$–$1\frac{4}{10}$ inch.

Hab. Jurruk, Kotree, Sonda, Tatta, Karachi, all in Lower Sind; many examples taken in April 1886.

A desert insect taken in sandy scrub, and very much the colour of dirty sand. It may be distinguished from all other described species of *Somena* by the fore wing being covered with black atoms, and by the absence of the marginal yellow spots.

LYMANTRIA VIOLA, n. sp.

Male. Antennæ, palpi, head, thorax, and fore wings grey; abdomen and hind wings rosy; palpi below and at the tips, a line on the inner side of the eye, and a thin line in front of the collar rosy; the grey on the thorax of a purer and paler colour than that of the fore wings, and spotted with blackish brown; abdomen with a dorsal row of black spots; fore wings covered with transverse, sinuous, blackish-brown bands, more or less macular on the basal half of the wing, the prominent medial (sinuous) and submarginal (dentated) bands of the female distinguishable in the male, and also a row of marginal brown spots.

Hind wing with a greyish-brown spot at end of cell and submarginal band of same colour, which does not reach the hinder angle; also indistinct spots on the margin between the veins.

Underside pale rosy grey, a grey spot at end of each cell; body rosy, a row of brown spots on each side of abdomen; femora rosy, tibiæ with brown and rosy bands.

Female with wing-markings much like ♀ *L. grandis*; antennæ black, palpi and thin line in front of collar bright crimson, lines on inside of eyes ochreous; head, thorax, and fore wing white; abdomen and hind wing rosy, two central rosy spots behind collar, some blackish-brown spots on the centre of thorax; fore wings with the bands as in *L. grandis*, but thinner and paler, of a pale reddish-brown colour, two or three spots at the base, a subbasal outwardly curved band, a spot on the costa, another below it, and a mark near hinder margin representing the antemedial band; medial band nearly upright, sinuous, very narrow, curving outside the lunular mark, which fills up the end of the cell and bifurcates on the costa; submarginal band of disconnected spear-shaped marks, very minute marginal spots between the veins, marginal line rosy.

Hind wing with a lunular greyish-brown mark at end of cell, a submarginal band as in male, minute marginal spots between the veins, and dark rosy outer margin.

Underside paler, with the markings showing through; body white, sides rosy; abdomen rosy, with two or three small brown spots on the sides; femora crimson; tibiæ white in centre, black at the joints; tarsi crimson, with black bands and black claws.

Expanse of wings, ♂ $1\frac{9}{10}$ inch, ♀ $3\frac{3}{10}$–$3\frac{5}{10}$ inches.

Hab. Thanna district, near Bombay; two males and many females, taken by me in November 1888, in the Waugui Forest.

A handsome local species, much smaller than the Himalayan *L. grandis* in both sexes, somewhat similar in the female, but very different in the male, the fore wing and thorax of the latter sex being dark grey, with prominent brown markings.

NOTODONTIDÆ.

BIRETA NANA, n. sp.

Allied to *B. longivitta*, Walker, and *B. xanthophila*.

Male and *female*. Fore wings pale, dull ochreous, costal and hinder margins darker, a longitudinal ochreous-brown central stripe from the base to less than one third from the outer margin, curving slightly upwards at the end towards the apex, and a discal and a submarginal curved row of brown dots.

Hind wings smoky brown, with dull ochreous border and fringe; antennæ with the shaft brown; plumes pale ochreous grey; palpi brown at the tips; head ochreous brown; thorax paler, with a brownish middle stripe; abdomen above greyish brown.

Below: wings pale yellowish, with thin centres, suffused with smoky brown, and this suffusion covers most of the body below; the legs are also marked with the same colour, the tibiæ of some specimens being entirely brown.

Expanse of wings 1½ inch.

Hab. North Kanara, June 1887. Two specimens received from Mr. Wise, Nilgiri Hills, four specimens received from Mr. Hampson.

One third less in size than *B. longivitta*, and distinguishable from it by the absence of the obliquely transverse denticulated lines on the fore wing.

PHINECA CANITIES, n. sp.

Male and *female*. Greyish white irrorated with grey, shaft of the antennæ white; fore wings with a broad antemedial, outwardly curved band, composed of two brown lines, with the space inside dark grey, the band being transected by two brown lines, one near the costa and the other just below the middle; also a discal row of black marks on the veins; marginal line grey. Hind wings rather paler than fore wings, unmarked, marginal line grey; cilia of both wings greyish white, with grey patches at the end of the veins; veins on both wings rather prominent. Head and thorax paler grey than the abdomen.

Underside paler than upperside; hind wings whitish, veins and cilia as above, a small whitish costal space one fourth from the apex of fore wings; hind wings with a central, outwardly curved, pale grey band; body and legs pale grey.

Expanse of wings 1–1$\frac{2}{10}$ inch.

Hab. North Kanara, June 1887. 4 ♂, 1 ♀, received from Mr. Wise.

This insect is most nearly allied to *P. basistriga*, Walk., Catal. Lep. Het. B.M. vii. p. 1747; the type specimen of which is in the British Museum Collection, but without locality.

Limacodidæ.

Thosea rara, n. sp. (Plate XLIII. fig. 9.)

Of a uniform clear slaty-grey colour, underside slightly the darker, head pale yellowish grey; fore wings covered with black atoms, and with a broad blackish discal band from the costa before the apex to the hinder margin one third from the hinder angle, edged with whitish on its inner side; a paler shade on the outside of the band, and the veins near the margin also whitish, making a broad macular marginal band.

Hind wings, wings below, body, and legs unmarked.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Thyetmeyo, October 1887. One fine example received from Mr. Noble.

Allied to *T. læsa*, but differs from it in the fore wing having a broad blackish discal band with a pale inner border, this band in *T. læsa* being very slender, incurved, and without any pale border.

Parasa fumosa, n. sp. (Plate XLIII. fig. 12.)

Palpi black, pale chrome-yellow beneath, shaft of antennæ black, pectinations reddish brown, head and thorax green; sides, hinder part of thorax, and abdomen above dark fuliginous black; sides of abdomen chrome-yellow; wings fuliginous black, but much paler than the colour of the abdomen; central portion of hind wings pale yellowish; veins of both wings black, rather prominently so; costal line of fore wings and fringe black, latter interlined at its base with a whitish line.

Underside: wings same as above, slightly paler; face, pectus, and body black, the chrome-yellow on the sides of the abdomen covering most of the under portions, but this does not occur in all the specimens; legs black, with a reddish tinge.

Expanse of wings $1\frac{2}{10}$ inch.

Hab. Nilgiri Hills. Three specimens received from Mr. Hampson.

An abnormally coloured species of the *P. lepida* group, unlike any previously described.

Cania pulligonis, n. sp. (Plate XLIII. figs. 7, 8.)

Male. Fore wings dark violet-brown covered with brown atoms, outer and hinder borders and base yellowish, an indistinct yellowish suffused spot at the end of the cell, and two brown lines from the hinder margin—the first medial, the second at one third from the hinder angle, meeting at the costa, very near to, but just before the apex; the first line nearly straight, the second curved outwardly, corresponding to the margin, and is in point of fact submarginal; antennæ pale greyish brown; head, body, hind wings above and below, and legs yellowish, of the same colour as the border of the fore wings; fore wings below blackish brown, with the veins and outer and hinder margins broadly yellowish.

Female. Fore wings reddish brown, with two yellow lines crossing the wing from the hinder margin and meeting at the apex, as in

the male, with the veins darker coloured, and without the yellow borders to the wing; hind wings and entire surface of both wings below pale reddish yellow, unmarked, the veins on the hind wings above rather prominent; antennæ, body above and below, and legs reddish brown; thorax with a pale suffused band in front, and abdomen with pale segmental bands.

Expanse of wing, ♂ 1 inch, ♀ $1\frac{1}{10}$–$1\frac{2}{10}$ inch.

Hab. North Kanara, June 1887. One male and two females received from Mr. Wise.

From *C. bilinea*, Walker, this species may be distinguished by the dark brown colour of the fore wings, and the two dark transverse lines in the male, these two lines in the female being of a pale colour.

MIRESA CRISPA, n. sp. (Plate XLIII. fig. 4.)

General colour of a uniform reddish chestnut-brown; antennæ, abdomen, hind wings, and underside paler; head and fore part of the thorax bright orange-yellow; fore wings shining, embossed with numerous crimped markings across the wings, and in some lights with some silvery speckles, which at the apex are collected together into a small patch; an indistinct straight band of darker colour from centre of hinder margin to costa close to the apex, the band in some lights having a pale centre, making it look like two thick lines close together.

Hind wings with the discoidal cell, the costal space above, and the anal border whitish.

Underside unmarked; legs chestnut-brown, fore legs with white markings, with a large white spot on the inner side in the female, a long white stripe on the tibia above, and several white bands on the tarsus above.

Expanse of wings $\frac{1}{2}$ inch.

Hab. Darjeeling. One good example, which has been unnamed in my collection for years.

This insect may be distinguished from all other described species of the genus by the peculiar transverse rows of short raised strigæ on the fore wing.

MIRESA PROPEXA, n. sp.

Ochreous brown, covered with blackish-brown atoms; fore wings with two dark brown bands—first discal, composed of two patches of atoms, one touching the hinder margin in the centre, inclining outwardly, and adjoining the other patch which is in front of the cell; second band submarginal, extending from the apex to the hinder angle; the hind wings are unmarked and are darker than the fore wings, as also are the antennæ, body, and legs; wings below paler than above, with some dark suffusions here and there. This insect varies somewhat in coloration, some specimens being much paler than others, and on these the outer band on the fore wings is more complete.

Expanse of wings 1 inch.

Hab. Sattara, June 1884; Poon, June and July 1887. Many examples taken.

From other described species this may be distinguished by the two peculiar black bands on the fore wing, the inner band being wavy and the outer band erect.

NOCTUES.

ACONTIIDÆ.

ACONTIA KARACHIENSIS, n. sp.

Male. Antennæ grey, body above and below pure white; fore wings white, costa with some grey markings, a greyish-brown line which goes upwards from centre of hinder margin, then abruptly bends to the apex, and has an excavation downwards where the reniform should be; this line has two black marks on each side of the excavation, and from it to the margin the wing is coloured dark grey; a marginal macular black line, and very broad grey fringe, with central and subapical white patches; hind wings white, with a slight grey marginal line, a slight greyish tinge on the border, and a grey interline in the white fringe.

Below: wings white and shining, with grey patches on the fringe of the fore wings; legs white, tarsi with grey bands.

Female. Differs from the male in having grey suffusions on the thorax and a grey abdomen; fore wings iron-grey, with the white showing through here and there, a white diffuse subcostal band extending from base to tips; hind wings greyish white, with the border a little darker, white patches in cilia same as in male.

Expanse of wings ♂ $\frac{9}{10}$ inch, ♀ 1 inch.

Hab. Karachi, June and July 1885–6. 5 ♂ and 10 ♀ taken.

Allied to *A. costalis.* Differs in the mottled grey fore wing, this wing in the male having the basal area, as well as the costal border, clear of markings.

APAMEIDÆ.

APAMEA MINIMA, n. sp.

Antennæ and palpi brown; head, thorax, and fore wings grey, with a yellowish flesh-coloured tint; head and thorax speckled with brown; fore wings suffused with greyish brown, transverse brown lines, subbasal and antemedian, both with a brown short longitudinal streak running outwardly from their centres; the subbasal line indistinct, with the streak very short and also rather indistinct; a discal oblique lunular brown line, the space from this to the margin paler than the rest of the wing; a submarginal, short, diffuse, brown lunular line with pale outer border from the hinder margin, stopping at one third from the apex, and a marginal line of black disconnected lunules; fringe brown, with pale patches; costa with brown marks; orbicular represented by a white dot; reniform also white, large, somewhat resembling the capital letter H.

Hind wings nearly white, with a yellowish flesh-coloured tinge, and

a very indistinct grey mark at the end of the cell; marginal line brown, fringe the same colour as the wing; abdomen greyish brown.

Underside: wings same colour as the hind wings above; fore wings suffused with brown on the costal and apical portions; hind wings also slightly suffused with pale brownish on the costal portion, with an indistinct grey mark at the end of the cell; body and legs grey; tarsi with yellowish bands.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Hydrabad and Kipra, Lower Sind. Four examples taken.

Unlike any previously described species.

NOCTUIDÆ.

SPŒLOTIS SINCERA, n. sp.

Male and *female*. Antennæ brownish; palpi pale sandy grey, black at the sides; top of head whitish; body and fore wings of a bright sandy fawn-colour; the divisions of the collar, tegulæ, &c. on the thorax are very prominent; the male is smaller than the female, and the whole of the thorax is more whitish, whereas in the female the whitish is only on the top of the head, otherwise they are identical; fore wings very minutely irrorated with brownish-grey atoms, orbicular and reniform minute, greyish, claviform larger, ringed with grey, but all very indistinct; three transverse very indistinct greyish sinuous lines, first subbasal, hardly visible, second and third more distinct; antemedial and postmedial well separated; fringe interlined.

Hind wings whitish, sandy grey on the outer borders.

Underside: wings much the same shade of colour as they are above, shining, the fore wing has a discal mark and some indistinct streaks towards the outer border, otherwise they are unmarked; body and legs pale sandy fawn-colour.

Expanse of wings, ♂ $1\frac{1}{10}$, ♀ $1\frac{2}{10}$ inch.

Hab. Solun (Simla). One pair in excellent condition from the late Captain Reed's collection.

From the allied *S. fraterna* this species differs in the much browner colour of the fore wings, the ante- and postmedial sinuous lines being much less defined, the outer line being disposed nearer to the end of the cell than in *S. fraterna*; the spot at end of the cell is also less defined and has no white border to it.

OCHROPLEURA IGNOTA, n. sp.

Palpi, antennæ, thorax, and fore wings chocolate-brown; palpi grey in front and at the tips; top of head grey, collar dull ochreous, abdomen dull ochreous grey; fore wings with the colour paling slightly towards the outer margin, with a broad grey stripe on the costa from the base along two thirds of its length, touching the upper portions of the orbicular and reniform marks, which are formed of prominent grey ringlets; the orbicular round, the reniform oblong, excavated on the outside, almost ear-shaped; the rest of the costal border to the apex marked with five or six yellow

points; a discal outwardly curved slightly sinuous line, of the same colour as the wing, but slightly darker; fringe pale reddish chocolate, interlined.

Hind wings white tinged with flesh-colour, with a flesh-coloured marginal line and an interline in the fringe.

Underside: wings shining; fore wings and the upper third of the hind wings pale reddish chocolate-brown, remainder of the hind wings pale whitish flesh-colour; fore wings with the inner part dark brown, and with a discal curved line on both wings, formed of elongated spots on the veins, a brown dot at the end of the cell in the hind wings; body and legs pale chocolate-brown.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Ceylon. One perfect example received from Mr. Fairlie.

Most nearly allied to *O. costalis*, from Darjeeling, but differs in its darker-coloured fore wing, in the oval shape of the orbicular spot, and in the absence of the black streaks intervening between the orbicular and reniform marks.

GRAPHIPHORA VIARIA, n. sp.

Male and *female*. Brownish fawn-coloured, tinged with olive-brown on the fore wings, head, and thorax. Antennæ of the male with greyish-brown pectinations; collar and tegulæ slightly paler than the rest of the thorax and with pale edges; fore wings with the orbicular large, nearly round, margined with brown, indistinct; reniform also large, pale yellowish, ear-shaped; costa with brown marks, some very indistinct transverse markings on the basal half of the wing; a postmedian, indistinct, brownish band, with a rather acute angle running outwards into the reniform; a discal row of elongated brown dots, with yellowish-white minute centres; a submarginal sinuous yellowish-white line, marginal lunules brown, fringe long, same general colour as the wing, but strongly interlined, first with a yellowish-white line, then with a distinct brown line; abdomen and hind wings greyish brown, costal portion of hind wings pale-coloured, a brown mark at the end of the cell; fringe as in the fore wings.

Underside paler, shining; hind wing with cell-mark as above, both wings with traces of a discal line; legs brown, middle and hind legs with spurs, and tarsi marked with white.

Expanse of wings $1\frac{4}{10}$ inch.

Hab. Umballa, March. Two pairs from late Captain Reed's collection.

This species has the pattern of markings on the fore wing as in *G. fasciata*, but less defined; the outer denticulated line and the pale wavy submarginal line are both nearer the margin.

ORTHOSIIDÆ.

ELYDNA DIURNA, n. sp. (Plate XLIII. fig. 10.)

Ochreous fawn-colour, fore wings speckled with red atoms, reniform mark represented by a brown ringlet, with a brown point in its

centre; four slightly sinuous brown lines across the wings; an antemedial, which is oblique, and touches the hinder border near the postmedial line; a postmedial and a discal rather near each other, nearly upright, the former slightly curved outwards, and a brown marginal line, the colour of the wing between this and the discal being darker than the rest of the wing, as is also the fringe, forming a broad marginal band.

Hind wings paler, and whitish towards the base; antennæ and body above ochreous fawn-colour, abdomen paler.

Below: wings, body, and legs whitish fawn-colour.

Expanse of wings $1\frac{4}{10}$ inch.

Hab. North Kanara. One example received from Mr. Wise.

From the allied *E. transversa* this species differs on the fore wing in the nearly erect position of the two outer lines, which in *E. transversa* are both angled outward beyond the end of the cell.

Catephidæ.

Anophia mosara, n. sp.

Palpi and collar greyish white, tips of palpi brownish, antennæ and body purplish grey; abdomen whitish at the sides, and with grey segmental bands; fore wings purplish fawn-colour, orbicular, in the form of a largish obliquely placed black ringlet; reniform large, excavated outwardly, and marked in the excavation with white, also a claviform ringlet, two outwardly oblique recurved, slightly dentated blackish lines, one before and the other beyond the middle, the space between darker than the rest of the wing; fringe pale pinkish, interrupted with brown; hind wings white, with a broad pale purplish fawn-coloured band; fringe white tipped with grey.

Underside whitish, with broad grey bands to both wings, and with a lunular mark at the end of the cell of the fore wings; body and legs grey, tarsi with brown bands.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Southern Sind, Hydrabad, and Tatta; one specimen at each place, taken in April 1887. Kihim, Alibagh district, near Bombay; one specimen, taken in April 1888.

From other described species of *Anophia* this may be distinguished by its comparatively narrower wings. The markings on the fore wing are similar in pattern to those in *A. olivascens*, but the hind wing has a uniformly narrower marginal band.

Polydesmidæ.

Pandesma jubra, n. sp. (Plate XLIV. fig. 4.)

Like a very large *P. quenavadi*, but differently coloured, very much larger and quite distinct. Antennæ, body, and fore wings steel-grey, irrorated with black atoms; top of head, front of palpi, and segmental bands on abdomen whitish, top and sides of the first joint of the palpi black. Fore wings above, with basal, antemedial, medial, and postmedial, sinuous, dark lines, the last three rather

close together; and a broad blackish discal band, sinuous inwardly, suffused outwardly towards the outer margin, and including a sinuous whitish line, a black spot in the centre of the antemedial line; orbicular represented by a black dot, reniform by a suffused large blackish spot, outer margin with black points, fringe steel-grey.

Hind wings white, a broad black outer border, attenuated hindwards, and without the usual anal whitish streak in the band; abdominal border suffused with grey, marginal line brown, marginal points black, fringe pure white.

Underside greyish white; tarsi brown, with whitish bands; wings nearly white, with a broad blackish marginal band on each wing, diffused outwardly to greyish on fore wings, and to pure white on hind wings; fringe and marginal points as above.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Rangoon, June 1888. One pair of this fine species received from Mr. Noble.

This is a larger insect than *P. quenavadi*, the wings being comparatively longer; the fore wing has similarly disposed markings, but these are more widely separated. The hind wing is less quadrate in form, the outer margin more rounded, and the marginal black band is broader at its upper end.

Ophiusidæ.

Ophiusa triangulata, n. sp. (Plate XLIII. fig. 5.)

Blackish brown, bands and lines white; fore wings with a central erect band slightly contracted in its centre, and irrorated with black atoms; from the lower extremity of this band on the hinder margin a thick line runs straight to the centre of the outer margin (but does not touch it), and is angled from thence straight to the costal margin, near to but a little apart from the central band, thus forming a complete and very prominent triangle; there is also a fine sinuous submarginal line from the hinder margin to the apex touching the elbow of the triangle; the submarginal space is paler coloured, and many of the veins are streaked with white, especially so near the outer margin; marginal festoon and points black; cilia grey, interlined.

Hind wings with a white fascia slightly before the middle, a thin white streak at the anal angle, and a thin white border; marginal line black; cilia grey.

Underside pale dirty greyish brown, with indistinct antemedial, medial, and postmedial grey bands, a submarginal sinuous pale line; outer margin thinly pale greyish; marginal festoon and points black; cilia grey.

Expanse of wings $1\frac{8}{10}$ inch.

Hab. Karachi, July 1886. One perfect example taken.

Nearly allied to *Ophiusa mirabilis*, Romanoff, Mém. Lép. ii. pl. 4. fig. 5 (1885), from Transcaucasia.

PSEUDO-DELTOIDES.

FOCILLIDÆ.

THYRIDOSPILA VIRGATA, n. sp.

Male and *female* of a uniform violet-brown above; fore wings of a deep black, an angular black patch on the costa near the apex, a blackish sinuous transverse line at one fourth from the base; a broad black band in the centre, which is inwardly distinctly defined and outwardly diffuse, terminating in a faint outwardly curved sinuous line; marginal line brown; cilia brown, whitish at the base.

Hind wing with an antememedial blackish stripe, corresponding to the inner edge of the medial band of fore wing, a discal blackish stripe of the same nature with a short blackish shade immediately below it near the abdominal border; marginal line and cilia as in fore wings.

Underside of a uniform pale brown, a faint spot at the end of each cell, and three faint outwardly curved lines across both wings, antemedial, medial, and postmedial, and close together.

Expanse of wings $1\frac{4}{10}$ inch.

Hab. Solun (Simla), June. One pair in good condition from the late Capt. Reed's collection.

Smaller than *T. sphæriphora*: wings not angular on the outer margin; pattern of markings similar, the precostal patch on the fore wing prominent; the orbicular mark absent.

PLATYDIDÆ.

EPISPARIS SORA, Moore, MS.

Body and wings above of a uniform rosy brown, irrorated with minute white atoms, very thickly so in some parts, giving the wing the appearance of being smeared with whitish, more especially towards the base and angles of both wings; fore wings with the costa broadly and irregularly ochreous, marked on the costal edge with white and brown; orbicular represented by a dot, reniform by a pure white streak, inside of which is a yellow angular mark; lines brown, faintly edged outwardly with white, first at one third from the base, dentated outwardly with two teeth, two zigzag sinuous lines rather close together beyond the middle, and a straight discal line from the hinder angle to the costa near the apex.

Hind wing with only the double line, the outer one of which has two or three acute dentations opposite the produced angle of the margin; cilia on both wings dark brown, prominent.

Underside paler, white irrorations denser, making the outside of fore wings and nearly all the hind wings whitish; fore wings with the black orbicular and white reniform very distinct, the discal line also distinct but slightly sinuous, and inside this is another sinuous almost straight line.

Hind wing with a discocellular lunular mark and with the double discal curved sinuous line, the outer one of the two being regularly

lunular and not dentated; legs whitish with black spots above: for legs brown, with white sides and white unmarked tarsi.

Expanse of wings $2\frac{1}{10}$ inches.

Hab. Assam. One example.

Nearest to *E. exprimens*. Wings more acutely angulated on the outer margins and of an entirely different colour; markings similarly disposed but without whitish edging.

DELTOIDES.

HYPENIDÆ.

HYPENA HERBIGRADA, n. sp.

Brown, very variable; fore wings slightly darker than the hind wings; fore wings with the orbicular and reniform in some specimens represented by pale dots, in some by black diffused marks, and in some they are not visible; a submarginal black sinuous line and a postmedial outwardly curved sinuous black line, from the centre of the hinder margin to the costa near the apex, and a submarginal row of black points; in some specimens the postmedial line is duplex; these lines are sometimes very distinct, sometimes some of them are absent, in one or two specimens there is hardly a trace of any of them, and in two specimens the space between the subbasal and postmedial lines are deep black, and the rest of the wing pale pinkish brown, but all the markings visible are of exactly the same construction, and all the specimens are undoubtedly of one variable species.

Hind wings unmarked.

Underside same colour as above, but slightly paler and without any markings.

Expanse of wings 1 inch.

Hab. Mahableshwar, May 1887, in great numbers in the short grass on the hill-sides.

Somewhat allied to *H. obaceralis*, but wings broader and shorter, the postmedial lines sinuous and recurved.

HYPENA RADICALIS, n. sp.

Belongs to the *H. longipennis* group; fore wings long narrow, similarly shaped. *Male* blackish brown, fore wings with orbicular and reniform represented by black spots hardly visible; an indistinct discal outwardly curved row of black dots marked with grey on the outer sides, a marginal line of black lunules and a greyish-white streak at the apex.

Hind wings slightly paler and with a marginal black line.

Underside pale blackish brown, unmarked except with a few yellowish-grey marks on the costa of the fore wings near the apex.

Female greyish brown tinged with pinkish, with a broad yellowish-grey costal band on the fore wings, which thickens beyond the middle, and has a whitish-grey streak at the apex, other markings same as in the male but more distinct; there is sometimes a whitish mark above the reniform spot, and in some specimens the costal border of the hind wings below is pale yellowish grey.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Nilgiri Hills, 6700 feet, July and August 1887. Nine males and six females received from Mr. Hampson.

From the allied *H. longipennis* this species differs in its shorter fore wings, which are darker in colour, uniform in tint, and do not show any of the speckled appearance of that species.

RHYNCHINA EREMIALIS, n. sp.

Male and *female* of a uniform dirty sandy greyish-buff colour; palpi thickly speckled with minute brown and black atoms; shaft of the antennæ very minutely marked with whitish, ciliated in the male, hairs whitish, simple in the female; head and thorax thickly and minutely irrorated with white, in some specimens more so than in others; fore wings with a faint grey mark at the end of the cell, and a faint grey streak from just behind the centre of the hinder margin to the apex, more apparent in the female than in the male; costa with some white marks towards the apex, costal line slightly darker than the rest of the wing, marginal lunular line to both wings brown, with minute whitish dots on the veins only sometimes visible; fringe broad, whitish, marked with grey patches, and the whole surface of both wings indistinctly marked with whitish and greyish longitudinal streaks, which are only apparent under the glass.

Underside paler, shining, with the longitudinal streaks more apparent, otherwise unmarked.

This is a purely desert moth taken in sandy scrub, and has so much the appearance of the sand in which it is found as to be invisible to the naked eye when settled.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Hydrabad, Kotree, Jerruck, Baraji, Tatta, all in Lower Sind. Taken in February, March, and April, 1886.

Distinguished from all other described Indian species of this genus by its uniform greyish-buff colour.

HERMINIIDÆ.

AGINNA LEVICULA, n. sp. (Plate XLIII. fig. 14.)

Male and *female* of a uniform brownish fawn-colour; fore wings irrorated with brown atoms, a brown mark at the end of the cell and three transverse indistinct brown lines—first antemedial sinuous, slightly curving outwards; second and third postmedial and discal dentated outwards, rather close together, and widely separated from the first; second also outwardly curved; third nearly upright, with faint yellowish dots on the points of the dentations, also a marginal row of small black lunules.

Hind wings slightly paler, more especially so towards the costa, otherwise unmarked.

Underside of a uniform pale brownish fawn-colour, a brown mark at the end of the cell in both wings, and two outer brownish lines edged outwardly with pale yellowish grey across both wings, more distinct on the hind wings; legs with brown streaks on the sides.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Solun (Simla), September. Three examples from the la
Captain Reed's collection.

From *A. robustalis* this species differs in having the outer li
on the fore wing denticulated, and the outer line on the hind wi
barely visible above, but well defined on the underside.

PYRALES.

Pyralidæ.

Stemmatophora foliata, n. sp. (Plate XLIV. fig. 5.)

Antennæ, palpi, head, and collar ochreous grey; body and wi
brownish fawn-colour, tinged with pale ochreous and irrorated wi
slaty grey atoms; fore wings much darker than the hind wings, hi
wings paler towards the base; fore wings with a brown spot at t
end of the cell, and both wings crossed by two wavy brown lines
first from costa one third from base, and the other from costa o
third from apex, both meeting in a rounded form close to t
abdominal margin of the hind wings at its centre, the outer li
edged outwardly with pale ochreous grey, the inner line only faint
visible in the hind wings; cilia ochreous grey interlined with brow

Underside pale bronzy grey irrorated with grey atoms; wi
shining; veins prominent, spot at the end of cell in fore wings an
outer line of both wings prominent.

Expanse of wings $1\frac{3}{16}$ inch.

Hab. Nilgiri Hills, 6700 feet, June 1887. Four examples fro
Mr. Hampson.

Allied to *S. vibicalis*, Lederer, of Ceylon, the type specimen
which has been compared with the present species. *S. vibicalis* i
a smaller insect and more robust, with somewhat differently shape
transverse lines.

Pyralis dulciculalis, n. sp.

Body and wings of a pale uniform reddish colour, one exampl
is tinged with greenish; abdomen with four or five lower segment
brown bands; fore wings with the costal line spotted with black an
yellow; a black spot at the end of the cell, and two nearly upright
slightly sinuous white lines—first antemedial inwardly bordered wit
brown, the second discal extending from the hinder angle to th
costa less than one third from the apex, and outwardly border
with brown, and the space between the lines is paler than the re
of the wing. Hind wings slightly darker than the fore wings, whiti
towards the costa, a white outwardly curved line just beyond th
middle, bordered with brown on both sides and which stops on th
whitish costal space, and has a large brown spot where it touch
the hinder margin.

Underside paler, shining, markings obscure; legs reddish, fore le
with black and yellow bands above.

Expanse of wings $\frac{8}{10}$ inch.

Hab. Mahableshwar, May 1887. Three examples.

Nearest to *P. platymitris*, Butler, from which it differs in its

form reddish colour, *P. platymitris* being dark brown with pale central bands. In *P. dulciculalis* the band on the fore wing is broader and of nearly the same reddish tint as the base and outer border.

Zonora, nov. gen.

Male and *female*. Fore wings long, narrow, exterior margin convex, slightly oblique, posterior margin oblique towards the base; palpi of the male long, depressed, twice the breadth of the head, thick at the base and curving to a very fine point at the tip, of the female very short, also depressed, pointed at the tip and not so long as the breadth of the head; antennæ of the male bipectinated, of the female simple but rather thick, basal joint of male straight and of uniform width; cell of fore wing in male extending two thirds the length, first subbasal branch starting at about one fourth before end of cell, second close to the end, third trifid, sixth contiguous to base of third, discocellular not visible; lower median at nearly one fourth before end of cell, submedian slightly recurved; hind wing rather broad, exterior margin and anal angle rounded; cell more than half the length; costal and subcostal running close together to end of cell, subcostal two-branched; discocellular bent acutely inward, radial from near lower end; lower median from nearly one third before end of cell; submedian and two internal veins wide apart.

Allied to the genus *Hypotia*.

Zonora opiparalis, n. sp. (Plate XLIV. fig. 11.)

Male and *female*. Top of head and front of thorax white; thorax and fore wings reddish brown, with a pale greenish bronzy tinge, a white stripe on each side of the thorax; palpi and antennæ grey; fore wings with a subcostal white stripe, a white streak at the apex; five large white spots, one at the middle of the base bending down on to the hinder margin, the second diamond-shaped, in the centre of the wing before the middle, the third long, ovate and medial just below the subcostal stripe, the fourth curved upwards exactly below the third and close to the hinder margin, and the fifth long, ovate, and just above and in front of the fourth, with its outer end touching a white submarginal line of spear-shaped marks; fringe brown, with white marks. Hind wings greyish white, with a submarginal central dentate brownish line, and with the marginal border brownish, the brown colour at the apex and central portion running into the white fringe of the wing.

Underside greyish white, with the markings on the upper portions of the fore wings showing through the wing.

Abdomen grey, with one or two white segmental bands at the base; body and legs below grey, without markings.

Expanse of wings, ♂ 1, ♀ 1$\frac{3}{10}$ inch.

Hab. Lower Sind. Hydrabad, 1 ♂, April 1886; Juda, 1 ♀, February 1886; and Kipra, 1 ♀, February 1886.

Allied to *Z. concatenalis*, from Syria, which has somewhat similarly disposed, but differently shaped, markings on the fore wings.

Botydidæ.

Nosophora lymphatalis, n. sp. (Plate XLIV. fig. 7.)

Top of the head yellow; antennæ, body, and wings of a uniform chocolate-brown; fore wings with a large angular space in the middle yellow, bordered by a dark brown line, the apex of the angle extending downwards to the submedian vein; a brown line closing the cell within the yellow patch, and a yellow subcostal round spot halfway between the triangular patch and the apex of the wing. Hind wing with a large central lobate semihyaline white patch, also bordered by a dark brown line; this patch is ear-shaped outwardly, straight on its inner side, with a streak extending some way downwards, fringe of both wings interlined with whitish.

Underside paler; wings marked as above; pectus and legs white, legs marked with brown at the joints.

Expanse of wings $1\frac{1}{10}$ inch.

Hab. Sibsaghor. Three examples received from the Indian Museum.

Differs from *N. chironalis* in the medial costal patch on the fore wing being very large and triangular in shape, and in the hind wing having a constricted white central spot.

Asopidæ.

Danaga pullatalis, n. sp.

Body and wings above dark brown; top of the head and collar yellowish; thorax with a yellow band behind; abdomen with a yellow band on second segment; wings with a pale yellow band one third from the base, which is broader and more diffuse on the hind wings; fore wings with a large, subcostal, almost square, pale yellow spot just before the middle, and a smaller angular pale yellow costal spot one third before the apex, and another yellow spot on the outer margin near the hinder angle. Hind wings with the costa broadly whitish. Underside paler, markings as above.

Expanse of wings $\frac{7}{10}$ inch.

Hab. Andaman Islands. Six examples received from Indian Museum.

From *D. concisalis*, Walker, this species differs in the fore wing in having a prominent quadrate spot on the middle of the costa, a triangular spot before the apex, and a less defined transverse subbasal band, which latter also extends across the base of the hind wing.

Spilomelidæ.

Nausinoë euroalis, n. sp. (Plate XLIV. fig. 12.)

Body and wings violet-grey; abdomen extending one third below the hind wings, with white segmental bands; fore wings with five equidistant bands of pure white, long, latitudinal, curved spots bordered with brown—first basal, second subbasal, third antemedial, composed of one long spot, each running downwards from near the costa, fourth and fifth discal and subapical composed of two long

spots each from below the costa; the second spot of the fourth line runs upwards from the hinder margin near the angle; the second spot of the fifth line adjoins the long spot above it.

Hind wings with nearly the basal half white and semihyaline, with a violet-grey band across the middle of the cell; the division between the white and violet-grey portions of the wing is formed by a sinuous brown line, and there is in the violet-grey portion a discal irregular band of four long, white, curved spots of the same shape and kind as the spots on the fore wings.

Underside much paler, with the markings as above.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Sibsaghar, six examples received from the Indian Museum. Sikhim, two examples received from Mr. Irvine.

Differs from *N. neptis* in the dark violet-grey colour of the wings (which in *N. neptis* are yellow) and in all the markings being narrower.

Synclera nemoralis, n. sp. (Plate XLIV. fig. 6.)

Pale yellow, irrorated with chocolate atoms; back of the head and thorax with some chocolate marks; abdomen silvery, with greyish segmental bands, anal tuft and band and spots on both wings chocolate-red; fore wings with a costal subbasal spot, and another on the hinder margin about one eighth from the base; a subbasal band between these spots; an antemedial band which is continued through the hind wings to the abdominal margin one third from the anal angle, and is curved outwardly on the fore wings, and is nearly straight on the hind wings; an upright slightly curved discal band also on the fore wings, which runs from the costa near the apex to the hinder angle, and runs from thence inwards in two curves, and joins the antemedial line on the hinder margin; there is also a lunular line at the end of the cell, a marginal band on both wings, which is continued a little round the apex of fore wings: at the centre of the margin of the hind wings is a spot from which a band runs up to the centre of the antemedial band in that wing, and another band runs up from the same spot in two zigzags to the costa of the wing at one third from the apex; cilia in both wings pale yellow, intersected by a clearly defined chocolate-coloured line.

Underside paler, with the bands showing through.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Solun (Simla). One example of this very pretty species, taken by Captain Reed, has been in my collection for years.

A smaller insect than *S. multilinealis*, with well-defined, transverse markings, and without the intermediate parallel denticulated lines.

Hydrocampidæ.

Hydrocampa simplalis, n. sp.

White, irrorated with ochreous grey; antennæ, palpi, head, and thorax ochreous; abdomen greyish white, with ochreous bands.

Wings with greyish ochreous lines and marks; fore wings with a

dot within the cell, a lunule at the end of it, an intermedial band or thick line, slightly oblique, not touching the costa, a medial band, which bends outwardly at its centre and then runs up to the costa at one third from the apex, a submarginal band and a double marginal line so close together as to leave the white between like submarginal spots; costal line ochreous, fringe ochreous with white marks. Hind wings with a dot at the end of the cell, a discal recurved band, a submarginal band, and marginal double line similar to those in the fore wings; fringe also similar to that in the fore wings.

Underside with the wings as on upperside; body and legs ochreous grey, unmarked.

Expanse of wings $\frac{7}{10}$ inch.

Hab. Lower Sind. One specimen taken at Karachi, October 1885, and five at Hyderabad in April 1886.

Distinguishable from other described Indian species of *Hydrocampa* by the well-defined ochreous lines, which are continuous on both wings.

Siculidæ.

Rhodoneura albatalis, n. sp. (Plate XLIV. figs. 1, 2.)

Male and *female*. Antennæ brown; head, thorax, abdomen, and wings pure silky white, costal line of fore wings with pale reddish-brown marks, and the whole surface of both wings covered with pale reddish-brown transverse reticulations, the reticulations being more sparse on the inner portion of the hind wings; one male specimen from North Kanara has a very small deep black mark at the apex of fore wings.

Underside same as above; legs white, with brown stripes; tarsi brown, with white bands.

Expanse of wings, ♂ $1\frac{1}{10}$, ♀ $1\frac{1}{2}$ inch.

Hab. Poona, 1 ♂, July 1887; North Kanara, 1 ♂, June 1886, from Mr. Wise; Raipur (C. P.), 1 ♀ from Mr. Betham.

Somewhat allied to *R. strigatula*, Felder. The fore wings are longer and narrower, the markings on both wings being more slender and like fine lacework disposed uniformly over the wings.

Crambidæ.

Suratha eremialis, n. sp.

Male and *female* of a dirty sandy grey colour; hind wings whitish towards the base, costa, and hinder margin; abdomen with greyish segmental bands, very long, extending for more than half its length beyond the hind wings; fore wings with an indistinct diffuse greyish stripe from base through the cell, bending abruptly upwards to the costa at less than one third before the apex, the curve being marked with darker grey in places, and a grey shade just before the band runs down to the hinder margin, about one third before the hinder angle, the upward and downward stripes forming a recurved discal band edged with whitish on its outer side.

Underside with body and legs pale grey, unmarked; wings whitish, each wing with a brownish patch in the disk.

Female of wings $1\frac{3}{10}$ inch.

Hab. Karachi, Jimpir, Tatta. Two pairs taken in April 1885–6.

A larger insect than *S. albirenalis*, Walker, and greyer in colour, with but a single, transverse, ill-defined, discal, denticulated band.

GEOMETRES.

EUSCHEMIDÆ.

MILIONIA LUCULENTA, n. sp. (Plate XLIII. fig. 3.)

Deep black; wings with some bright blue streaks near the base, with a bright orange-crimson medial band across both wings; on the fore wing the band inclines from the costa before the middle to the hinder margin beyond the middle, is nearly straight in its central portion on the outer side, but bends abruptly on to both margins, and is curved on its inner side; on the hind wing the band is slightly narrower, is slightly sinuous, and extends from the abdominal margin, one third from the anal angle, to the end of the cell, where it is elbowed outwardly, and there is a small crimson spot between the end of the band and the costa.

Below same as above; antennæ, head, body above and below, and legs black.

Expanse of wings $2\frac{4}{10}$ inches.

Hab. Andaman Islands. One example in the Indian Museum.

Allied to *M. butleri*, Druce, P. Z. S. 1882, p. 781, pl. lxi. fig. 4, from Sumatra, but differs in the band on the fore wing being broader and not dentate at the end of the cell; the band on the hind wing is narrow and disposed across the middle of the wing.

ENNOMIDÆ.

CROCALLIS BILINEARIA, n. sp.

Allied to *Crocallis angularia*, Moore.

Male and *female*. Yellowish fawn-colour, thickly irrorated with minute, ill-defined, blackish atoms, which are more or less confluent, and form short, transverse, indistinct strigæ; a blackish spot with a white centre at the end of the cell in both wings; a postmedial, brownish, indistinct line, outwardly edged with white, across both wings, recurved in fore wings, slightly sinuous in hind wing, and an antemedial, brownish, outwardly curved line across fore wing; this line is not nearly so distinct as the other, and is obsolete in some specimens; a very indistinct, antemedial, erect, diffused line on the fore wing. Hind wings paler than fore wings; marginal line reddish brown, fringe white; scollops on fore wing (which are less in the male than in the female) formed as in *C. angularia*.

Underside paler, colour uniform, markings as above.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Kassaoli; one specimen from the late Capt. Reed's collection. Kulu; two specimens from the Indian Museum.

Near to *C. angularia*, but differs from it in its colour and in the much less prominent transverse lines, of which the antemedial line on the fore wing is erect, straight, and somewhat outwardly oblique, this line in *C. angularia* being outwardly curved and angulated on

close together; and a broad blackish discal band, sinuous inwardly, suffused outwardly towards the outer margin, and including a sinuous whitish line, a black spot in the centre of the antemedial line; orbicular represented by a black dot, reniform by a suffused large blackish spot, outer margin with black points, fringe steel-grey.

Hind wings white, a broad black outer border, attenuated hindwards, and without the usual anal whitish streak in the band: abdominal border suffused with grey, marginal line brown, marginal points black, fringe pure white.

Underside greyish white; tarsi brown, with whitish bands; wings nearly white, with a broad blackish marginal band on each wing, diffused outwardly to greyish on fore wings, and to pure white on hind wings; fringe and marginal points as above.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Rangoon, June 1888. One pair of this fine species received from Mr. Noble.

This is a larger insect than *P. quenavadi*, the wings being comparatively longer; the fore wing has similarly disposed markings, but these are more widely separated. The hind wing is less quadrate in form, the outer margin more rounded, and the marginal black band is broader at its upper end.

Ophiusidæ.

Ophiusa triangulata, n. sp. (Plate XLIII. fig. 5.)

Blackish brown, bands and lines white; fore wings with a central erect band slightly contracted in its centre, and irrorated with black atoms; from the lower extremity of this band on the hinder margin a thick line runs straight to the centre of the outer margin (but does not touch it), and is angled from thence straight to the costal margin, near to but a little apart from the central band, thus forming a complete and very prominent triangle; there is also a fine sinuous submarginal line from the hinder margin to the apex touching the elbow of the triangle; the submarginal space is paler coloured, and many of the veins are streaked with white, especially so near the outer margin; marginal festoon and points black; cilia grey, interlined.

Hind wings with a white fascia slightly before the middle, a thin white streak at the anal angle, and a thin white border; marginal line black; cilia grey.

Underside pale dirty greyish brown, with indistinct antemedial, medial, and postmedial grey bands, a submarginal sinuous pale line; outer margin thinly pale greyish; marginal festoon and points black; cilia grey.

Expanse of wings $1\frac{8}{10}$ inch.

Hab. Karachi, July 1886. One perfect example taken.

Nearly allied to *Ophiusa mirabilis*, Romanoff, Mém. Lép. ii. pl. 4. fig. 5 (1885), from Transcaucasia.

PSEUDO-DELTOIDES.

FOCILLIDÆ.

THYRIDOSPILA VIRGATA, n. sp.

Male and *female* of a uniform violet-brown above; fore wings of a deep black, an angular black patch on the costa near the apex, a blackish sinuous transverse line at one fourth from the base; a broad black band in the centre, which is inwardly distinctly defined and outwardly diffuse, terminating in a faint outwardly curved sinuous line; marginal line brown; cilia brown, whitish at the base.

Hind wing with an antememedial blackish stripe, corresponding to the inner edge of the medial band of fore wing, a discal blackish stripe of the same nature with a short blackish shade immediately below it near the abdominal border; marginal line and cilia as in fore wings.

Underside of a uniform pale brown, a faint spot at the end of each cell, and three faint outwardly curved lines across both wings, antemedial, medial, and postmedial, and close together.

Expanse of wings $1\frac{4}{10}$ inch.

Hab. Solun (Simla), June. One pair in good condition from the late Capt. Reed's collection.

Smaller than *T. sphæriphora*: wings not angular on the outer margin; pattern of markings similar, the precostal patch on the fore wing prominent; the orbicular mark absent.

PLATYDIDÆ.

EPISPARIS SORA, Moore, MS.

Body and wings above of a uniform rosy brown, irrorated with minute white atoms, very thickly so in some parts, giving the wing the appearance of being smeared with whitish, more especially towards the base and angles of both wings; fore wings with the costa broadly and irregularly ochreous, marked on the costal edge with white and brown; orbicular represented by a dot, reniform by a pure white streak, inside of which is a yellow angular mark; lines brown, faintly edged outwardly with white, first at one third from the base, dentated outwardly with two teeth, two zigzag sinuous lines rather close together beyond the middle, and a straight discal line from the hinder angle to the costa near the apex.

Hind wing with only the double line, the outer one of which has two or three acute dentations opposite the produced angle of the margin; cilia on both wings dark brown, prominent.

Underside paler, white irrorations denser, making the outside of fore wings and nearly all the hind wings whitish; fore wings with the black orbicular and white reniform very distinct, the discal line also distinct but slightly sinuous, and inside this is another sinuous almost straight line.

Hind wing with a discocellular lunular mark and with the double discal curved sinuous line, the outer one of the two being regularly

male is so thickly covered as to almost hide the white ground-colour, and to leave no distinguishing bands above or below; the female has a subbasal, medial, and a submarginal band across both wings, formed of patches and speckles closer together than in the other parts of the wings, the submarginal band being prominently dentated in the Mhow example, especially towards the apex of the fore wings; head and hinder part of thorax and tip of the abdomen ochreous; antennæ of the male greyish ochreous, of the female brown, with ochreous-grey bands.

Underside much paler, with a brown spot at the end of each cell in both sexes, the submarginal band prominent in the female; front of head brown, face and pectus ochreous: body and legs of male greyish ochreous, unmarked; of the female greyish ochreous, with brown marks on abdomen, in one specimen forming regular segmental bands, and in all the specimens with brown bands on the legs and with brown tarsi.

Expanse of wings, ♂ 2–2½, ♀ 3–3$\frac{2}{10}$ inches.

Hab. Mhow, June 1882, one pair; Poona, September 1883, one ♂; North Kanara, one ♂, June 1886, one ♀, August 1886, received from Mr. Wise.

From *B. multipunctaria*, Walker, this species differs in its extremely dark colour, the wings being densely mottled, especially those of the male, and in the ill-defined transverse dentated bands, traceable here and there only by irregular-shaped ochraceous patches; these bands in the female are well defined and are more or less densely bordered by black scales.

Boarmiidæ.

Narapa breta, n. sp.

Male and *female*. Grey, tinged with pale pinkish, the entire surface of the body and wings thickly irrorated with brown and black atoms; fore wings with an outwardly-curved, slightly sinuous antemedial black line, which thickens on the costa, another black zigzag line, commencing at the middle of the hinder margin, recurved and ending on the costa, about one third from the apex, marked with black on the angles, and thickening downwards on the lower part, above which and between the two lines are some deep black marks, forming a sort of black medial interrupted band; a zigzag submarginal whitish line, marked on the inner side with black; marginal festoon black, marginal black points and some black marks against the outer margin of the wing, especially towards the apex. Hind wings with a black band before the middle, in connexion with the medial black band of the fore wing; a central, outwardly-curved zigzag black line, and a submarginal whitish, indistinct, sinuous line and marginal festoon and points as on fore wings; fringe of both wings with brown markings opposite the angles of the festoon.

Underside pale pinkish grey, thinly irrorated with brown, with a brownish spot at the end of each cell, the central lines showing through the wings, and a diffused discal blackish band on both wings, which forms a large patch near apex of fore wings; legs pinkish grey; fore tibia with black bands.

Expanse of wings 1$\frac{3}{10}$ inch.

Hab. Nilgiri Hills, 6700 feet, July and August 1887. Nine males and six females received from Mr. Hampson.

From the allied *H. longipennis* this species differs in its shorter fore wings, which are darker in colour, uniform in tint, and do not show any of the speckled appearance of that species.

RHYNCHINA EREMIALIS, n. sp.

Male and *female* of a uniform dirty sandy greyish-buff colour; palpi thickly speckled with minute brown and black atoms; shaft of the antennæ very minutely marked with whitish, ciliated in the male, hairs whitish, simple in the female; head and thorax thickly and minutely irrorated with white, in some specimens more so than in others; fore wings with a faint grey mark at the end of the cell, and a faint grey streak from just behind the centre of the hinder margin to the apex, more apparent in the female than in the male; costa with some white marks towards the apex, costal line slightly darker than the rest of the wing, marginal lunular line to both wings brown, with minute whitish dots on the veins only sometimes visible; fringe broad, whitish, marked with grey patches, and the whole surface of both wings indistinctly marked with whitish and greyish longitudinal streaks, which are only apparent under the glass.

Underside paler, shining, with the longitudinal streaks more apparent, otherwise unmarked.

This is a purely desert moth taken in sandy scrub, and has so much the appearance of the sand in which it is found as to be invisible to the naked eye when settled.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Hydrabad, Kotree, Jerruck, Baraji, Tatta, all in Lower Sind. Taken in February, March, and April, 1886.

Distinguished from all other described Indian species of this genus by its uniform greyish-buff colour.

HERMINIIDÆ.

AGINNA LEVICULA, n. sp. (Plate XLIII. fig. 14.)

Male and *female* of a uniform brownish fawn-colour; fore wings irrorated with brown atoms, a brown mark at the end of the cell and three transverse indistinct brown lines—first antemedial sinuous, slightly curving outwards; second and third postmedial and discal dentated outwards, rather close together, and widely separated from the first; second also outwardly curved; third nearly upright, with faint yellowish dots on the points of the dentations, also a marginal row of small black lunules.

Hind wings slightly paler, more especially so towards the costa, otherwise unmarked.

Underside of a uniform pale brownish fawn-colour, a brown mark at the end of the cell in both wings, and two outer brownish lines edged outwardly with pale yellowish grey across both wings, more distinct on the hind wings; legs with brown streaks on the sides.

Expanse of wings $1\frac{3}{10}$ inch.

margins of fore wings whitish, and with the white subcostal marks as on the upperside.

Expanse of wings 1½ inch.

Hab. Sikhim. One specimen purchased from Mr. Paul Möwis, and one received from Mr. Irvine.

From *E. signata*, Butler, this differs in its extremely dark colour, broader wings, the outer margin of both fore and hind wings being even, not sinuous as in *E. signata*. On the fore wing the antemedial diffuse black line is inwardly oblique, this line in *E. signata* being erect and excurved; there is no duplex medial transverse line, which is conspicuous in *E. signata*.

MACARIDÆ.

GUBARIA SUBALBATARIA, n. sp.

Male. Palpi and antennæ dull ochreous; head, thorax, and general colour of both wings chocolate-grey; head between antennæ ochreous yellow, as also is the abdomen, which has a chocolate-grey dorsal stripe, broad at the base, and tapering to and terminating at about one third from the apex; all the grey portions are powdered with white; in reality the ground-coloration is white, but the chocolate-grey irrorations are so dense as only to leave the ground-colour showing through in places; there is a very broad medial oblique white band right across both wings, and this band is also thickly covered with grey irrorations, making it look dirty greyish white; the band does not quite touch the costa of the fore wings, it has an inner sinuous grey, and a straight outer darker line, this line being sometimes inwardly margined with pure white; a brown lunule at the end of cell in fore wings, a broad one at end of cell in hind wings, a costal subapical angular dark patch on fore wings and one (sometimes two) dark distal streaks outside the band on the hind wings; marginal line brown; fringe ochreous grey, interlined.

Underside: body and legs ochreous, unmarked; wings with a broad band as above, but pure white, space inside the band being also white, marked with brownish and ochreous striations, the space outside the band dark chocolate-brown, with a whitish subapical spot on fore wings, and a whitish marginal patch on hind wings towards anal angle, but this patch is wanting in some specimens.

The female differs from the male in being of dark olivaceous-grey colour; the palpi, body below, legs, and abdomen above and at the sides are white instead of ochreous, there being merely some ochreous colour in the centre of the abdomen below; the antennæ are grey speckled with white, the central broad stripe across the wings above is duller, the outer margin diffuse, the straight line being wanting; in the wings below the outer third is nearly black and unmarked, except for the subapical white spot on the fore wings, the inner two thirds is pure white, irrorated with purplish brown, more thickly so near the base inside the band, which is indicated by a blackish sinuous line.

Expanse of wings $1\frac{8}{10}$ inch.

Nilgiri Hills, 3600 feet, October 1887, 1 ♀, 2 ♂, received
. Hampson and Mr. Lindsay; North Kanara, one ♀, received
. Wise.

st to *G. xanthonora*, but recognizable by the entirely different
both sexes; the oblique discal band crossing both the wings
er, and in the male almost of the same colour as the base
r border. This band also, in the female, is ill defined and
the same colour as the other parts.

LARENTIDÆ.

IA MULTIFARIA, n. sp. (Plate XLIV. fig. 9.)

and fore wings pale olive-brown, tinged with pinkish; collar
læ black, with white borders, some black marks on the
nd a dorsal row of blackish short stripes on the abdomen;
s with several deep black bands, some of which are composed
every separate black mark being completely ringed with a
white line as follows:—two black dots at the base, four, a
zer, alongside, the costal one largest; then follow two more
black spots, with a smaller one between, and five spots, the
e the largest, then a very broad median band, which expands
and divides on the median vein, splitting into two branches
e costa, having two small black spots on the costa between
his band is followed by a subapical band of three separate
hich are transversely long, the costal one much the largest
ly excavated on its outer side, also an apical triangular spot,
nall dot below it; the subapical band is continued to the
argin, in the form of a brown sinuous line, where it termin-
two more black spots; the spaces between the black bands
ed with sinuous brown lines; the median vein is white and
t, cutting through the bands from the base to near the
rgin of the central band; the hinder margin of the wing is

wings grey, with an outwardly curved sinuous darker post-
ne, and a faint submarginal whitish similar line; marginal
oth wings brownish, and the fringe greyish yellow, interlined
ed with brown.

side of a uniform pale olive-brown; a brown dot at end of
; a discal, outwardly curved, dentated, brown line, outwardly
with grey, across both wings, a brown mark edged with
w it, near anal angle; marginal line and fringe as above.

se of wings $1\frac{6}{10}$ inch.

Darjeeling. One perfect example of this very handsome
urchased from Mr. Paul Möwis.

to *C. cervinaria*, but differs on the fore wing in the black
e medial band being broader (this band being formed of
inct portions, the two upper divided from the lower by a
ale line extending along that part of the median vein) and
ter narrow irregular band being disposed nearer the margin.

EUPITHECIA INFESTATA, n. sp.

Fore wings very long, outer border rounded, slightly oblique, costa and hinder margin almost straight; abdomen rather stout, long, extending one third beyond the hind wings; general coloration cinereous grey, marginal line in both wings brown, fringe varied and interlined with whitish; fore wings with a prominent brown spot at the end of the cell, and both wings with an indistinct submarginal lunular whitish line, but in most of the specimens this is obsolete: hind wings paler towards the costa, with some brown marks near the anal border towards the angle.

Underside paler, with a brown spot at the end of each cell, and a discal submarginal faint line on each wing, and some brown marks on the costa of the fore wings near the apex; tibia with brown bands.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Mhow, October; Poona and Khandalla, October; Nilgiri Hills, 6800 feet, June to September: numerous specimens.

Somewhat allied to the European *E. minuta*, but slightly larger and with less defined markings.

ZERENIDÆ.

ABRAXAS LUTEOLARIA, n. sp.

Ochreous yellow, markings black: fore wings, costa with black dots and marks, the entire wing irrorated with black atoms; three subbasal costal marks like the commencement of bands, and two complete bands—one antemedial but very near the middle, the other discal; the first bent towards the costa, the other nearly straight and inclining outwards; a black rib within both bands on each vein; fringe interlined with black, giving the wing the appearance of a black marginal line.

Hind wings much paler whitish on the basal half, the irrorations more sparse, and with two bands corresponding to the two complete bands of the fore wings—the first incomplete, and on one specimen hardly visible; the other band composed of a streak on the hinder margin, and a spot on each vein, forming a band corresponding with the shape of the outer margin: head and body of the same yellow colour as the fore wings; head and thorax with some black dots; abdomen with a dorsal row of black spots and some on the sides.

Below the wings are of a pale uniform dull yellow, irrorated and marked as above; body ochreous; antennæ and legs black.

Expanse of wings 2 inches.

Hab. Nilgiri. Hills. One pair, in perfect condition, received from Mr. Hampson.

Nearest to the Darjeeling *A. irrorataria* (P. Z. S. 1867, p. 652), which is a yellowish species with black irrorations on the fore wings. *A. luteolaria* differs in the fore wing being more densely irrorated, and in the male having a well-formed medial and postmedial blackish band, and also a maculated band on the hind wing, these bands being less defined in the female.

ABRAXAS POLIARIA, n. sp.

Male and *female*. Wings cinereous brown; both sexes sparsely orated with orange-yellow; an ill-defined dusky spot at end of the l in the fore wing, and a less defined transverse discal and a medial row shade on both wings; the discal shade on the fore wing being ghtly recurved, the medial straight, and those on the hind wing, en apparent, incurved; body deep yellow, spotted with slaty black; ennæ in male thick, setaceous, slender in female; antennæ and s slaty black.

Expanse of wings, ♂ $1\frac{4}{5}$, ♀ $1\frac{6}{5}$ inch.

Hab. Nilgiri Hills, 6700 feet. Four pairs received from Mr. mpson.

Nearest to *A. ditritaria*, Walker, the wings of which, in both es, are both densely covered with bluish-grey strigæ, these strigæ ng more or less confluent on the fore wing, and in the male en- ely covering that wing: the outer shady line on the fore wing has a ckish point on each vein. The antennæ of the male of *A. ditri- ia* are slender and minutely ciliated on both sides. In *A. poliaria* antennæ of the male are thicker and somewhat flattened.

ABRAXAS OSTRINA, n. sp.

Male. Antennæ, head, body above and below, and legs and wings ove and below of a uniform dark violaceous greyish black; fore ngs above with a yellowish basal spot, two antemedial and two sub- cal costal yellow marks like short inward streaks, and a similar itish mark in the middle of the abdominal margin of the hind ngs, with a corresponding spot on the costa, and a point between e the indication of a medial line. Underside same as above, but in e of the examples some of the spots above and below are absent; ad and thorax marked with bright ochreous, abdomen with similarly oured bands; below, there is one ochreous spot in the centre of the domen, and some ochreous tufts at the base of the legs.

The female differs from the male in being somewhat paler and ving the pale yellowish-white costal marks larger, and in having broad disjointed white band containing one or two black spots ross the centre of the hind wings; underside same as upperside.

Expanse of wings $1\frac{6}{10}$—$1\frac{8}{10}$ inch.

Hab. Nilgiri Hills. Three perfect specimens received from Mr. mpson.

Distinguishable from all other described Indian species by its in- sely dark colour and peculiarly disposed markings.

ABRAXAS TODARA, n. sp. (Plate XLIV. figs. 13, 14.)

Male and *female*. Yellowish white; head and body yellow, spotted h black; legs yellowish beneath and purple-brown above; antennæ ck; fore wings sparsely speckled with dark purple-brown and h five large equidistant patches on the costal border, the latter, cepting the basal patch, are more or less confluent, with a trans- sely disposed irregular-shaped medial and discal patch; cilia

alternated with purple-brown; hind wing whiter than the fore wing, speckled with grey-brown, and having a greyish-brown subbasal and a discal narrow fascia, both of which are more or less broken and dentated, cilial spots, and a spot at end of all.

Expanse of wings, ♂ 1⅝, ♀ 1⅞ inch.

Hab. Nilgiris. Four pairs in Mr. Moore's collection and one male received by me from Mr. Lindsay.

Nearest to *A. fasciatia*, Guérin, Deless. Voy. pl. 26, but differs in its smaller size and in being more numerously speckled on both wings, also in the irregular-shaped patches on the fore wing.

EXPLANATION OF THE PLATES.

Plate XLIII.

Fig. 1. *Spilarctia ummera*, ♀, n. sp., p. 405.
2. *Miopolastes hampsoni*, ♂, n. sp., p. 402.
3. *Miltonia luculenta*, n. sp., p. 423.
4. *Mireza crispa*, n. sp., p. 409.
5. *Ophiusa triangulata*, n. sp., p. 414.
6. *Notioptera properta*, ♂, n. sp., p. 400.
7. *Cania pulligonis*, ♂, n. sp., p. 408.
8. —— ——, ♀, n. sp., p. 408.
9. *Thosea rara*, n. sp., p. 408.
10. *Elydna diurna*, n. sp., p. 412.
11. *Syntomis wimberleyi*, n. sp., p. 400.
12. *Parasa fumosa*, n. sp., p. 408.
13. *Somena abjecta*, ♀, n. sp., p. 405.
14. *Aginna levicula*, ♂, n. sp., p. 417.
15. *Alosa insolata*, n. sp., p. 404.

Plate XLIV.

Fig. 1. *Rhodoneura albatalis*, ♂, n. sp., p. 422.
2. —— ——, ♀, n. sp., p. 422.
3. *Pterothysanus noblei*, ♂, n. sp., p. 401.
4. *Pandesma jubra*, ♀, n. sp., p. 413.
5. *Stemmatophora foliata*, n. sp., p. 418.
6. *Synclera nemoralis*, n. sp., p. 421.
7. *Nosophora lymphatalis*, n. sp., p. 420.
8. *Phyletis borealis*, n. sp., p. 427.
9. *Cidaria multifaria*, n. sp., p. 429.
10. *Spica luteola*, ♂, n. sp., p. 424.
11. *Zonora opiparalis*, ♂, n. sp., p. 419.
12. *Nausinoë euroalis*, n. sp., p. 420.
13. *Abraxas todara*, ♂, n. sp., p. 431.
14. —— ——, ♀, n. sp., p. 431.

3. Note on *Python curtus*. By G. A. Boulenger.

[Received September 13, 1889.]

(Plate XLV.)

It is surprising that a large and fine Snake inhabiting a comparatively well-explored district should have so long escaped detection, as is the case with *Python curtus*, of which a specimen from Malacca (figured on Plate XLV.) is now exhibited in the Society's

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PYTHON CURTUS

the median vein. In *C. angularia* the dots on the fore wings are very prominent, much larger, are ochreous brown, and do not form strigæ.

Spica, nov. gen.

Wings long, rather broad; costa much arched at the base, apex acute, exterior margin round, slightly oblique, hinder margin arched before the middle, cell open, extending three fifths the length, costal vein running parallel with and close to the subcostal vein; first and second subcostal branches emitted together before end of cell, third from end bifid; upper radial and third subcostal from the same root and not joined to the 1st and 2nd subcostals; lower radials disconnected, 2nd and 3rd median branches from end of median vein; 1st median branch at one third from end of median vein, submedian vein slightly curved.

Hind wings about three fourths the length of fore wings, apex not acute, exterior margin roundly oblique, abdominal margin also round, cell open, about half the length of the wing, no costal vein, subcostal curved upwards from end of cell (which is very broad) and ends just below the apex, throwing a branch below at one third from end of cell and a second from end of cell; radial vein and third and second median branches are emitted together at the end of cell from the median vein, the radial vein curving up suddenly from the root; first median branch and submedian vein as usual, internal vein absent; body and abdomen stout, latter extending to end of hind wings; head and thorax in front with long hairs; palpi stout, fringed with long hairs to the tips, slightly ascending, but do not reach to the vertex; antennæ simple, thicker in the male, slightly ciliated; legs stout, middle and hind spurs long and stoutish.

This genus is allied to *Colotois*, Felder (Reise d. Nov. pl. 123. fig. 28).

Spica luteola, n. sp. (Plate XLIV. fig. 10.)

Male and *female*. Antennæ, palpi, head, body, and fore wings dull golden yellow, irrorated with reddish atoms; fore wings with the veins reddish, and with three equidistant, transverse, outwardly oblique, reddish lines—antemedial, medial, and postmedial; the first deeply angled outwardly where the first median branch is emitted from the median vein, the second almost straight, the third curved in its upper portion on to the costa; a reddish streak at the apex, faint indications of a subbasal line and a marginal sinuous line.

Hind wings pale yellow, unmarked.

Underside of a uniform pale yellowish colour, shining, with the whole of the inner portion of the fore wings clouded with brown, and crossed by some indistinct brownish bands; body and legs below darker yellow.

Expanse of wings $1\frac{1}{10}$ inch.

Hab. Sikhim. One male received from Mr. Elwes, and two females purchased from Mr. Paul Möwis.

In general outline this insect is distinguishable from *Colotois kumetaria* (Feld. Reise d. Nov. pl. 123. fig. 28) by its longer wings,

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male is so thickly covered as to almost hide the white ground-colour, and to leave no distinguishing bands above or below; the female has a subbasal, medial, and a submarginal band across both wings, formed of patches and speckles closer together than in the other parts of the wings, the submarginal band being prominently dentated in the Mhow example, especially towards the apex of the fore wings; head and hinder part of thorax and tip of the abdomen ochreous; antennæ of the male greyish ochreous, of the female brown, with ochreous-grey bands.

Underside much paler, with a brown spot at the end of each cell in both sexes, the submarginal band prominent in the female; front of head brown, face and pectus ochreous: body and legs of male greyish ochreous, unmarked; of the female greyish ochreous, with brown marks on abdomen, in one specimen forming regular segmental bands, and in all the specimens with brown bands on the legs and with brown tarsi.

Expanse of wings, ♂ 2–2½, ♀ $3\frac{2}{10}$ inches.

Hab. Mhow, June 1882, one pair; Poona, September 1883, one ♂; North Kanara, one ♂, June 1886, one ♀, August 1886, received from Mr. Wise.

From *B. multipunctaria*, Walker, this species differs in its extremely dark colour, the wings being densely mottled, especially those of the male, and in the ill-defined transverse dentated bands, traceable here and there only by irregular-shaped ochraceous patches; these bands in the female are well defined and are more or less densely bordered by black scales.

Boarmiidæ.

Narapa breta, n. sp.

Male and *female*. Grey, tinged with pale pinkish, the entire surface of the body and wings thickly irrorated with brown and black atoms; fore wings with an outwardly-curved, slightly sinuous antemedial black line, which thickens on the costa, another black zigzag line, commencing at the middle of the hinder margin, recurved and ending on the costa, about one third from the apex, marked with black on the angles, and thickening downwards on the lower part, above which and between the two lines are some deep black marks, forming a sort of black medial interrupted band; a zigzag submarginal whitish line, marked on the inner side with black; marginal festoon black, marginal black points and some black marks against the outer margin of the wing, especially towards the apex. Hind wings with a black band before the middle, in connexion with the medial black band of the fore wing; a central, outwardly-curved zigzag black line, and a submarginal whitish, indistinct, sinuous line and marginal festoon and points as on fore wings; fringe of both wings with brown markings opposite the angles of the festoon.

Underside pale pinkish grey, thinly irrorated with brown, with a brownish spot at the end of each cell, the central lines showing through the wings, and a diffused discal blackish band on both wings, which forms a large patch near apex of fore wings; legs pinkish grey; fore tibia with black bands.

Expanse of wings $1\frac{3}{10}$ inch.

Hab. Nilgiri Hills, 6700 feet, June, July, August, and September 1887; sixteen specimens from Mr. Hampson. Poona, November 1887; one specimen.

Most nearly allied to the Ceylonese *N. adamata*, Felder, Reise d. Nov. pl. 136. fig. 5, but differs on the fore wing in the greater width between the antemedial and postmedial lines, the antemedial line being single (not double as in *N. adamata*); the postmedial line is less sinuous, and its lower end more inwardly oblique; on the hind wings the discal line is acutely sinuous.

Fidonidæ.

Phyletis borealis, n. sp. (Plate XLIV. fig. 8.)

Antennæ grey, shaft pale reddish brown; abdomen grey; thorax and fore wings reddish fawn-colour, a pale reddish-brown dot at the end of the cell, a broad straight pale reddish-brown discal band, with irregular borders, a marginal line, and an indistinct shadowy submarginal pale band; costal line and hinder margin thinly brownish, fringe reddish brown.

Hind wings pale reddish grey, a pale reddish-brown dot at end of cell, and a broad, discal, outwardly curved band, corresponding to the band on fore wings, composed of two diffuse pale reddish-brown lines, with the space between them slightly darker than the general coloration of the wing.

Underside pale reddish grey, with the markings showing through, and with the interior portion of fore wings suffused with reddish brown.

Expanse of wings $1\frac{4}{10}$ inch.

Hab. Kulu. Two specimens received from Mr. Elwes, from Pangi, and one specimen from Col. Marshall. The Pangi specimen is a little redder than the Kulu specimen, but is otherwise identical.

This species is nearest to *P. meonaria*, Guénée, but differs on the fore wing in the transverse discal oblique band being broader, its broadest part being the upper end, and in its outer border being sinuous; whereas in *P. meonaria* this band is obsolescent at its upper end, its outer border is even and has a distinct red inner border.

Both wings have a well-defined spot at end of the cell (not present in *P. meonaria*).

Epifidonia absona, n. sp.

Male. Of a uniform dark reddish purple; wings with the red coloration showing in places; fore wings with a precostally angulated postmedial duplex black line and a diffused antemedial line, two pale greyish patches on the costa before the angle of the line, a pure white dot below the first patch and three white spots below the second patch, two of them large, one below the other, the third very small and on the inner side.

Hind wings with a large subapical space on the costa red.

Underside ochreous red, striated with brown, some brown patches on the outer portions of the wings and also in their centre; hinder

margins of fore wings whitish, and with the white subcostal marks as on the upperside.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Sikhim. One specimen purchased from Mr. Paul Möwis, and one received from Mr. Irvine.

From *E. signata*, Butler, this differs in its extremely dark colour, broader wings, the outer margin of both fore and hind wings being even, not sinuous as in *E. signata*. On the fore wing the antemedial diffuse black line is inwardly oblique, this line in *E. signata* being erect and excurved; there is no duplex medial transverse line, which is conspicuous in *E. signata*.

MACARIDÆ.

GUBARIA SUBALBATARIA, n. sp.

Male. Palpi and antennæ dull ochreous; head, thorax, and general colour of both wings chocolate-grey; head between antennæ ochreous yellow, as also is the abdomen, which has a chocolate-grey dorsal stripe, broad at the base, and tapering to and terminating at about one third from the apex; all the grey portions are powdered with white; in reality the ground-coloration is white, but the chocolate-grey irrorations are so dense as only to leave the ground-colour showing through in places; there is a very broad medial oblique white band right across both wings, and this band is also thickly covered with grey irrorations, making it look dirty greyish white; the band does not quite touch the costa of the fore wings, it has an inner sinuous grey, and a straight outer darker line, this line being sometimes inwardly margined with pure white; a brown lunule at the end of cell in fore wings, a broad one at end of cell in hind wings, a costal subapical angular dark patch on fore wings and one (sometimes two) dark distal streaks outside the band on the hind wings; marginal line brown; fringe ochreous grey, interlined.

Underside: body and legs ochreous, unmarked; wings with a broad band as above, but pure white, space inside the band being also white, marked with brownish and ochreous striations, the space outside the band dark chocolate-brown, with a whitish subapical spot on fore wings, and a whitish marginal patch on hind wings towards anal angle, but this patch is wanting in some specimens.

The female differs from the male in being of dark olivaceous-grey colour; the palpi, body below, legs, and abdomen above and at the sides are white instead of ochreous, there being merely some ochreous colour in the centre of the abdomen below; the antennæ are grey speckled with white, the central broad stripe across the wings above is duller, the outer margin diffuse, the straight line being wanting; in the wings below the outer third is nearly black and unmarked, except for the subapical white spot on the fore wings, the inner two thirds is pure white, irrorated with purplish brown, more thickly so near the base inside the band, which is indicated by a blackish sinuous line.

Expanse of wings $1\frac{8}{10}$ inch.

Hab. Nilgiri Hills, 3600 feet, October 1887, 1 ♀, 2 ♂, received from Mr. Hampson and Mr. Lindsay; North Kanara, one ♀, received from Mr. Wise.

Nearest to *G. xanthonora*, but recognizable by the entirely different colour in both sexes: the oblique discal band crossing both the wings is broader, and in the male almost of the same colour as the base and outer border. This band also, in the female, is ill defined and nearly of the same colour as the other parts.

Larentidæ.

Cidaria multifaria, n. sp. (Plate XLIV. fig. 9.)

Body and fore wings pale olive-brown, tinged with pinkish; collar and tegulæ black, with white borders, some black marks on the thorax, and a dorsal row of blackish short stripes on the abdomen; fore wings with several deep black bands, some of which are composed of spots, every separate black mark being completely ringed with a pinkish-white line as follows:—two black dots at the base, four, a little larger, alongside, the costal one largest; then follow two more bands of black spots, with a smaller one between, and five spots, the costal one the largest, then a very broad median band, which expands upwards, and divides on the median vein, splitting into two branches up to the costa, having two small black spots on the costa between them; this band is followed by a subapical band of three separate spots, which are transversely long, the costal one much the largest and deeply excavated on its outer side, also an apical triangular spot, and a small dot below it; the subapical band is continued to the hinder margin, in the form of a brown sinuous line, where it terminates with two more black spots; the spaces between the black bands are shaded with sinuous brown lines; the median vein is white and prominent, cutting through the bands from the base to near the outer margin of the central band; the hinder margin of the wing is grey.

Hind wings grey, with an outwardly curved sinuous darker post-medial line, and a faint submarginal whitish similar line; marginal line on both wings brownish, and the fringe greyish yellow, interlined and patched with brown.

Underside of a uniform pale olive-brown: a brown dot at end of each cell; a discal, outwardly curved, dentated, brown line, outwardly bordered with grey, across both wings, a brown mark edged with grey below it, near anal angle; marginal line and fringe as above.

Expanse of wings $1\frac{6}{10}$ inch.

Hab. Darjeeling. One perfect example of this very handsome species, purchased from Mr. Paul Möwis.

Allied to *C. cervinaria*, but differs on the fore wing in the black transverse medial band being broader (this band being formed of three distinct portions, the two upper divided from the lower by a distinct pale line extending along that part of the median vein) and in the outer narrow irregular band being disposed nearer the margin.

EUPITHECIA INFESTATA, n. sp.

Fore wings very long, outer border rounded, slightly oblique, costa and hinder margin almost straight; abdomen rather stout, long, extending one third beyond the hind wings; general coloration cinereous grey, marginal line in both wings brown, fringe varied and interlined with whitish; fore wings with a prominent brown spot at the end of the cell, and both wings with an indistinct submarginal lunular whitish line, but in most of the specimens this is obsolete: hind wings paler towards the costa, with some brown marks near the anal border towards the angle.

Underside paler, with a brown spot at the end of each cell, and a discal submarginal faint line on each wing, and some brown marks on the costa of the fore wings near the apex; tibia with brown bands.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Mhow, October; Poona and Khandalla, October; Nilgiri Hills, 6800 feet, June to September: numerous specimens.

Somewhat allied to the European *E. minuta*, but slightly larger and with less defined markings.

ZERENIDÆ.

ABRAXAS LUTEOLARIA, n. sp.

Ochreous yellow, markings black: fore wings, costa with black dots and marks, the entire wing irrorated with black atoms; three subbasal costal marks like the commencement of bands, and two complete bands—one antemedial but very near the middle, the other discal; the first bent towards the costa, the other nearly straight and inclining outwards; a black rib within both bands on each vein; fringe interlined with black, giving the wing the appearance of a black marginal line.

Hind wings much paler whitish on the basal half, the irrorations more sparse, and with two bands corresponding to the two complete bands of the fore wings—the first incomplete, and on one specimen hardly visible; the other band composed of a streak on the hinder margin, and a spot on each vein, forming a band corresponding with the shape of the outer margin: head and body of the same yellow colour as the fore wings; head and thorax with some black dots; abdomen with a dorsal row of black spots and some on the sides.

Below the wings are of a pale uniform dull yellow, irrorated and marked as above; body ochreous; antennæ and legs black.

Expanse of wings 2 inches.

Hab. Nilgiri. Hills. One pair, in perfect condition, received from Mr. Hampson.

Nearest to the Darjeeling *A. irrorataria* (P. Z. S. 1867, p. 652), which is a yellowish species with black irrorations on the fore wings. *A. luteolaria* differs in the fore wing being more densely irrorated, and in the male having a well-formed medial and postmedial blackish band, and also a maculated band on the hind wing, these bands being less defined in the female.

ABRAXAS POLIARIA, n. sp.

Male and *female*. Wings cinereous brown; both sexes sparsely irrorated with orange-yellow; an ill-defined dusky spot at end of the cell in the fore wing, and a less defined transverse discal and a medial narrow shade on both wings; the discal shade on the fore wing being slightly recurved, the medial straight, and those on the hind wing, when apparent, incurved; body deep yellow, spotted with slaty black; antennæ in male thick, setaceous, slender in female; antennæ and legs slaty black.

Expanse of wings, ♂ $1\frac{4}{8}$, ♀ $1\frac{6}{8}$ inch.

Hab. Nilgiri Hills, 6700 feet. Four pairs received from Mr. Hampson.

Nearest to *A. ditritaria*, Walker, the wings of which, in both sexes, are both densely covered with bluish-grey strigæ, these strigæ being more or less confluent on the fore wing, and in the male entirely covering that wing: the outer shady line on the fore wing has a blackish point on each vein. The antennæ of the male of *A. ditritaria* are slender and minutely ciliated on both sides. In *A. poliaria* the antennæ of the male are thicker and somewhat flattened.

ABRAXAS OSTRINA, n. sp.

Male. Antennæ, head, body above and below, and legs and wings above and below of a uniform dark violaceous greyish black; fore wings above with a yellowish basal spot, two antemedial and two subapical costal yellow marks like short inward streaks, and a similar whitish mark in the middle of the abdominal margin of the hind wings, with a corresponding spot on the costa, and a point between like the indication of a medial line. Underside same as above, but in one of the examples some of the spots above and below are absent; head and thorax marked with bright ochreous, abdomen with similarly coloured bands; below, there is one ochreous spot in the centre of the abdomen, and some ochreous tufts at the base of the legs.

The female differs from the male in being somewhat paler and having the pale yellowish-white costal marks larger, and in having a broad disjointed white band containing one or two black spots across the centre of the hind wings; underside same as upperside.

Expanse of wings $1\frac{6}{10}$—$1\frac{8}{10}$ inch.

Hab. Nilgiri Hills. Three perfect specimens received from Mr. Hampson.

Distinguishable from all other described Indian species by its intensely dark colour and peculiarly disposed markings.

ABRAXAS TODARA, n. sp. (Plate XLIV. figs. 13, 14.)

Male and *female*. Yellowish white; head and body yellow, spotted with black; legs yellowish beneath and purple-brown above; antennæ black; fore wings sparsely speckled with dark purple-brown and with five large equidistant patches on the costal border, the latter, excepting the basal patch, are more or less confluent, with a transversely disposed irregular-shaped medial and discal patch; cilia

alternated with purple-brown; hind wing whiter than the fore wing, speckled with grey-brown, and having a greyish-brown subbasal and a discal narrow fascia, both of which are more or less broken and dentated, cilial spots, and a spot at end of all.

Expanse of wings, ♂ $1\frac{6}{8}$, ♀ $1\frac{7}{8}$ inch.

Hab. Nilgiris. Four pairs in Mr. Moore's collection and one male received by me from Mr. Lindsay.

Nearest to *A. fasciatia*, Guérin, Deless. Voy. pl. 26, but differs in its smaller size and in being more numerously speckled on both wings, also in the irregular-shaped patches on the fore wing.

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[Received September 13, 1889.]

(Plate XLV.)

It is surprising that a large and fine Snake inhabiting a comparatively well-explored district should have so long escaped detection, as is the case with *Python curtus*, of which a specimen from Malacca (figured on Plate XLV.) is now exhibited in the Society's

PYTHON CURTUS

Mintern Bros imp.

[redacted]

Reptile-house [1]; and that it should simultaneously turn up from several distinct localities is yet more remarkable. Described by Hubrecht, in 1879, from Sumatra, it was recorded two years later from Singapore by Blanford; and I find that the Python described in 1881 by Steindachner as *P. breitensteini*, from Borneo, of which a young specimen, noticed by the late J. G. Fischer, is now in the British Museum, is probably nothing but a synonym of *P. curtus*. It is true that Steindachner mentions seven pitted upper labials, whereas there are only two in *P. curtus*; but it is very probable that the author, in his MS., made use of the figure 2, which was taken for a 7 by the printer, and that the discrepancy is merely due to such an error. If, on re-examination, Steindachner's typical specimen should prove to have only the first two labials pitted, it may be safely held to be identical with *P. curtus*, the synonymy of which would then be as follows:—

1879. *Python curtus*, Hubrecht, Notes Leyden Mus. i. p. 244 (between Padang and Indrapura, Sumatra).
1881. *Python curtus*, Blanford, P. Z. S. 1881, p. 222 (Singapore).
1881. *Python breitensteini*, Steindachner, SB. Ak. Wien, lxxxii. p. 267 (Teweh, Borneo).
1884. *Aspidoboa curta*, Sauvage, Bull. Soc. Philom. (7) viii. p. 143 (Sumatra).
1885. *Python breitensteini*, Fischer, Arch. f. Nat. li. p. 68, pl. v. fig. 5 (N.E. Borneo).

The genus *Aspidoboa* was founded by Sauvage on the assumed absence of præmaxillary teeth; but as these teeth are present in the young specimen before me, I can see no reason, in spite of the somewhat aberrant physiognomy, for placing *Python curtus* in a separate genus.

4. On some Points in the Anatomy of the Female Organs of Generation of the Kangaroo, especially in relation to the acts of Impregnation and Parturition. By E. C. Stirling, M.A., M.D. Cantab., F.R.C.S. Eng., Lecturer on Physiology in the University of Adelaide.

[Received August 28, 1889.]

Without claiming to be acquainted at first hand with much of the literature of the subject, I am aware that there has been much discussion concerning the sexual apparatus of the Macropodidæ. The present notes are a contribution to that part of the discussion that has centred round the questions whether or not an opening between the central median canal and the urogenital passages is of constant occurrence; and in the second place whether the embryo in the process of extrusion passes through the central canal or through one or other of the lateral passages.

[1] Presented by Mrs. Bonsor (see above, p. 393).

The literature bearing on these and other allied points has been concisely summarized by Messrs. Lister and Fletcher in the 'Proceedings' of this Society for 1881, p. 977. These authors also there record a condition of patency of the aforesaid opening in some species in which its existence had not been previously noted. I observe that while "no one as yet seems to have had the good fortune to find an embryo in any part of the vaginæ," Messrs. Lister and Fletcher nevertheless come to the following conclusion, which I quote:—"In the very early condition of the Macropodidæ the median canal is closed." Again they say:—

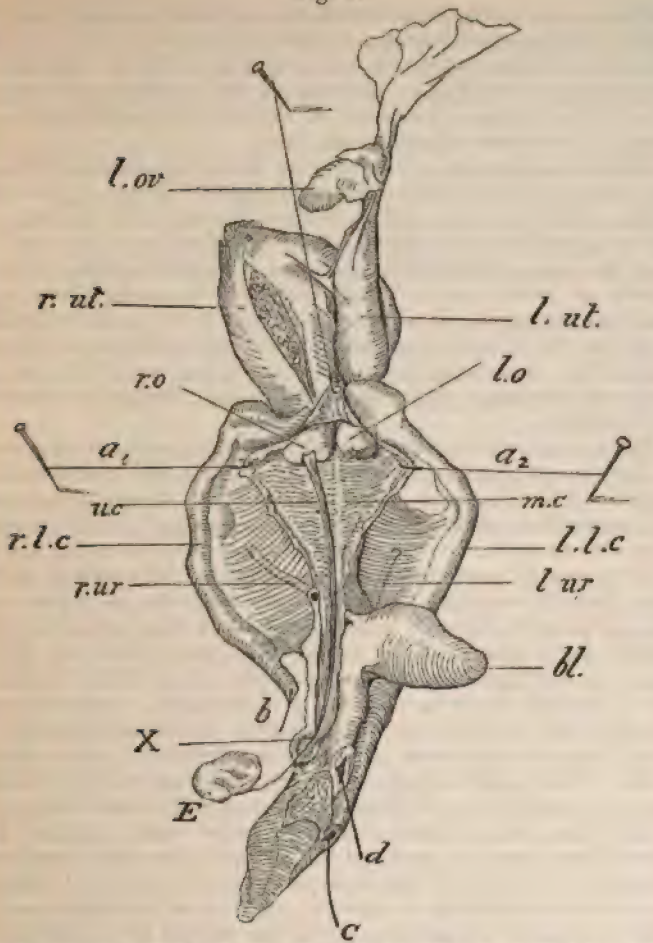
"In some genera, viz. *Macropus*, *Halmaturus*, *Petrogale* (*Dorcopsis* and *Dendrolagus?*), an opening is formed in the median canal to give passage to the young. This may take place in early life (*Halmaturus*), or not till young are about to be produced (*Macropus*). In the species *Macropus major*, however, this opening may or may not exist, and the young may be transmitted either through the median or the lateral canal."

For one species of Kangaroo, at least, this question of the route taken by the embryo may be considered settled, for I have been fortunate enough to obtain a specimen of the female organs of *Osphranter erubescens*, Scl., which contain the embryo in course of transit along the passages.

The organs in question, having been extracted by unskilled hands, were somewhat mutilated in the process, and further the operator, a cook in the camp of rabbiters, being a man of some intelligence and himself curious on the subject of marsupial parturition, had commenced an examination on his own account. These circumstances answer for the fact that the specimen is not anatomically complete, the lower part of the right lateral canal, a small part of the lower extremity of the left, and almost the whole of the urogenital passage having been cut away or left behind in the process of extraction. In the partial examination to which the specimen had been subjected before it came into my hands, the median canal had also been partially slit up from the front; and in view of existing incisions I found it convenient to continue the dissection from this side instead of from the posterior (dorsal) aspect, by which the parts can be more satisfactorily displayed. Fortunately the essential parts and their relations to one another had not been disturbed, and the following is a brief description of the specimen, represented in the accompanying drawing (fig. 1, p. 435) of about four fifths of the natural size.

The embryo, closely enveloped in a thin amnion, was 11, 6, and 5 mm. in the long, antero-posterior, and lateral diameters respectively; its anterior extremities distinctly five-partite, and the posterior distinctly three-partite and smaller than the anterior. The eyes just discernible as dark rings. It was suspended by a cord, which was extremely attenuated for some little distance from its point of attachment, though on unravelling this it was found to be distinctly membranous even at its thinnest part. The exact method of attachment of the cord to the body of the embryo cannot be stated with exactitude in this specimen, owing to the laceration which

Fig. 1.



Female organs of *Osphranter erubescens* ($\frac{1}{4}$ natural size). As explained in the text, nearly the whole of the urogenital passage has been cut away, but the drawing shows the median canal, *m.c*, completely laid open along the ventral median line and the cut edges pulled apart by the threads a_1, a_2.

Emerging from the right os uteri, *r.o*, is the umbilical cord, *u.c*, which is seen to pass along the median canal, *m.c*, and to emerge from this by an opening, X. To the attenuated extremity of this cord is attached the embryo, E. Other references:—*r.ut*, *l.ut*, right and left uterus, the former considerably enlarged and partially laid open; *l.ov*, left ovary; *bl*, bladder; *r.l.c*, *l.l.c*, right and left lateral canals; *b*, *c*, bristles passed through their cut ends; *d*, bristle passing into urethra similarly cut across just before its termination in the urogenital passage; *r.o*, *l.o*, right and left os uteri; *r.ur*, *l.ur*, right and left ureters.

The openings from the lateral canals into the median are concealed from view, but were to be found just above the internal extremities of the lines *r.o*, *l.o*. Bulgings appear at the commencement of each lateral canal, crossed in the sketch by the same lines, *r.o* and *l.o*, but there was nothing inside to account for the swellings.

had taken place before the specimen came to hand, to which laceration, in fact, the above-mentioned attenuation of the cord was due; but there were distinct traces of a torn membrane similar to that constituting the cord attached to the edge of the umbilical aperture. A small coil of intestine protruded at the umbilicus, and no trace of allantois was visible external to the body.

Following the course of the cord to its attachment, it is seen to pass through a well-defined orifice of about 2–3 mm. in diameter, which opened into the median canal. The edges of this opening were longitudinally corrugated. In this median canal the cord became thicker, and was visibly composed of a semitranslucent tubular membrane much crumpled longitudinally; in its walls ran three considerable vessels. Indications of similar vessels could be traced back into the shrivelled and attenuated portion of the cord next to the embryo; but, owing to the small size of the part of the vascular system of the embryo they communicated with, they could be hardly distinguished.

This tubular cord continued though the median canal, which showed on the internal surface of its posterior (dorsal) wall a well-marked median raphe, rising in its lower part into a ridge of such prominence as to mark off two distinct channels; and proceeding from this median ridge were conspicuous transverse and oblique striæ, giving the surface a partly striated, partly reticulated appearance. The cord lay in the right hand of these divisions. The os of each uterus opened into the median canal through a prominent nipple-like projection only slightly larger than that on the left side, though the body of the organ on the right side was several times larger than its fellow. Traced through the os into the cavity of the right uterus the cord expanded into a thick and much plicated membrane, the folds of which dipped deeply down into corresponding sulci of the uterine lining. The two structures, however, were easily separable, there being apparently no vascular or other organic connection between them.

Not being able to satisfy myself as to the exact nature of the connection between the cord and the embryo in the above specimen, on account of its small size and partly torn condition, I referred to a larger specimen of an embryo, probably of *Macropus major*, which I happened to possess. From the absence of a record concerning it, I am unable to be positively sure either of the species to which it belonged or of the conditions under which it was found, but for various reasons I have little doubt but that it was a uterine embryo belonging to the aforesaid species. This was 25 mm. long, exclusive of tail, and closely enveloped in a transparent amnion which was reflected from the cord to about an inch which still remained attached.

The substance of the cord itself was formed of a close, tough membrane closely adherent to the edge of the umbilical aperture, and it concealed a small protruding loop of intestine. In its walls ran three vessels, the connections of which with the fœtal vascular system I need not repeat here, as I found them to be exactly as described by Sir Richard Owen in his 'Anatomy of Vertebrates,' vol. iii. p. 719.

The allantois was represented by a shrivelled cord-like structure terminating in a blunt club-like extremity, lying alongside the other constituents of the cord and easily separable from them. This allantois was continuous with the fundus of the bladder, from which it extended 8 mm.

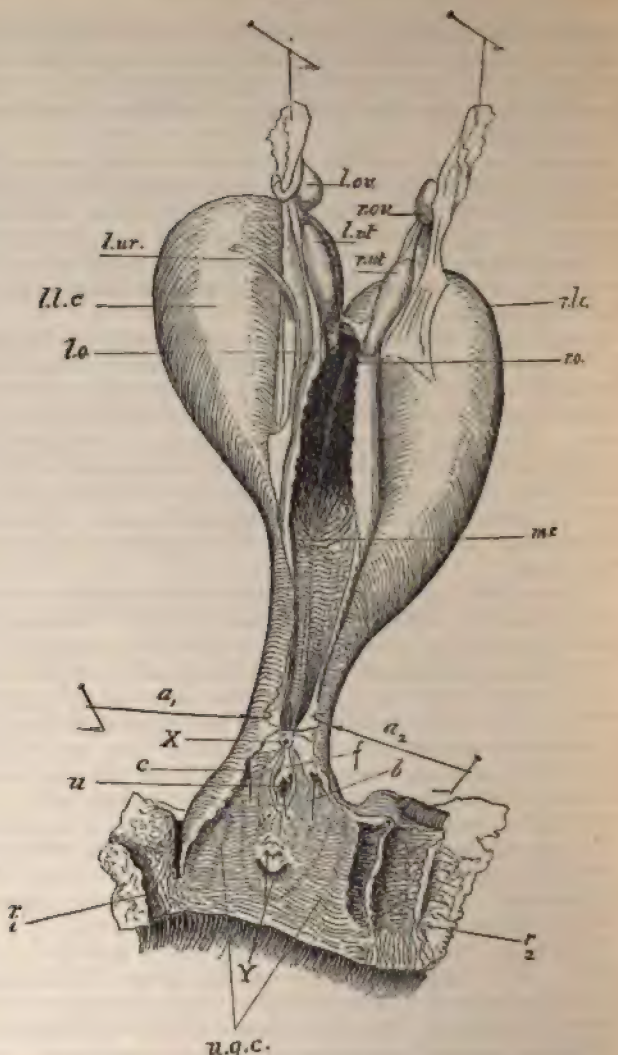
Along with the question of the route outwards of the embryo has been discussed also the route inwards of the seminal fluid, whether, in fact, this goes by the lateral canal or by the median canal when this is open. I am able to throw some light on this point (at least for *Macropus major*) by the receipt recently of a specimen of the female organs of an adult of this species shot immediately after an observed act of coitus.

In this specimen, which is represented in the drawing (fig. 2, p. 438) about one half of the natural size, the lateral canals were enormously distended by what proved to be six and a quarter ounces (by weight) of a viscid tenacious mucus-like substance containing abundant spermatozoa. The median canal was also distended to a size which would, in its upper part, more than contain two good-sized thumbs, and which contained some of the same kind of mucus-like material as that in the central canals, the mass in each being continuous. In its lower third the median canal narrowed down to a size that would scarcely admit a pencil.

The opening between the median and each lateral canal was very large and patent, admitting a large thumb easily. Both anterior (ventral) and posterior (dorsal) walls of the median canal were no thicker than stout parchment, and the internal surface of the former showed a distinct median raphe, which, as in the preceding specimen, rose into such a well-marked ridge in the lower part as to divide the passage into two similar well-marked channels. The same striated and reticulated appearance of its walls in the lower part also existed. Between the median canal and the urogenital passage there was a well-defined but small passage that would barely admit an ordinary steel knitting-needle. Seven mm. below this aperture, on the anterior (ventral) wall of the urogenital passage, was the orifice of the uretha (*u*, figs. 2 & 3); and between these two openings extended a laterally compressed keel-like projection (*vide* figs. 2 & 3, *f*), 5 mm. in height, thin at its free edge, springing from a base (6 mm. long and 3 mm. wide) from the posterior (dorsal) surface of the urethra. In fact the urethra might be described as piercing longitudinally the base of this projection. Both the urethral orifices and this keel-like ridge occupied a narrow ellipsoidal and depressed area marked off by a well-marked (*g*, fig. 3) ridge of corresponding outline.

Situated in the middle line, exactly midway between the orifice of the urethra and the joint outlet of the combined urogenital and rectal canals, was a flat tongue-like process (Y, fig. 2), compressed dorso-ventrally and pointing inferiorly towards the outlet of the passage. This covered up a cul-de-sac, which extended upwards under it for 5–6 mm., and with a similar width. On the posterior dorsal surface of this tongue-like flap was another smaller cul-de-sac, leading upwards also for about 3 mm., and with about the same

Fig. 2.



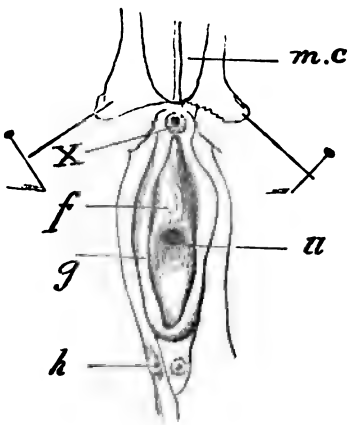
Female organs of *Macropus major* (½ natural size).

The organs have been laid open by a *dorsal* median incision. The two lateral canals, *l.l.c*, *r.l.c*, are seen enormously distended in their upper parts. The upper part of the median canal, *m.c*, is also much distended. The large openings between this and the lateral canals are not seen; *l.o* points to the os of the left uterus, *r.o* to the right os; *r.ov*, *l.ov*, right and left ovaries. The threads, a_1, a_2, pull asunder the walls of the lower part of the median canal, in which can be seen the ridge spoken of in the text, X, opening between the median canal and the urogenital passage, *u.g.c*; *u*, orifice of urethra, into which a bristle is passed and just above this is the keel-like process, *f*, described in the text and represented on a larger scale in fig. 3; Y, points to the larger and smaller culs-de-sac described in the text; r_1, r_2, the two lateral halves of the rectum completely cut across longitudinally in laying open the median canal from behind; *b*, *c*, bristles passed into the openings of the right and left lateral canals into the urogenital passage.

width. No apertures of any kind could be detected opening into either of these culs-de-sac or any structure rudimentary, or otherwise, in connection with them. No trace of a bifid arrangement. Structures similar to this and the preceding I have neither met with nor seen described, and I leave their nature and relations for further description and investigation, this being foreign to my present purpose.

The conspicuous longitudinal ridges in the ventral wall of the urogenital canal described by Mr. Fletcher (Proceedings of the Linnean Society of New South Wales, vol. vi. 1881), whose description I have frequently been able to confirm, were not in this case very well marked; still, two ill-defined folds of mucous membrane were

Fig. 3.



Enlarged sketch of parts adjacent to urethral orifice of *Osphrante erubescens*, Sol.

m.c, median canal; X, opening between this and the urogenital passage; *u*, orifice of urethra; *f*, keel-like process extending between *u* and X; *g*, ridge marking off the ellipsoidal space in which *u* and *f* are situated; *h*, openings of ducts of Bartholin.

recognizable in the positions indicated by him; other ridges existed still less well marked and of irregular arrangement.

In the above description I have made no attempt to treat in any way exhaustively the subject of the anatomy and the homologies of the female generative organs, and there is much even in these two specimens which seems to require further examination and explanation. There seems also to exist a considerable amount of variation in the disposition and relations of the various parts even in closely allied species. I present these very important notes particularly with the view of throwing light upon the questions as to which passages are traversed by the seminal fluid and the embryo respectively. So

far as these points are concerned, it seems clear that in *Macropus major* the semen passes inwards by the lateral canals, even when the opening into the median canal exists, and in *Osphranter erubescens* that the embryo passes out by the median canal; but in view of the differences of structure and relations of the different parts that have been observed in different genera and species, it is not yet safe to say that these statements constitute a rule for the whole of the Macropodidæ.

5. Contributions to the Natural History of an Annelid of the Genus *Dero*. By Frank E. Beddard, M.A., F.Z.S.

[Received September 25, 1889.]

I have had the opportunity lately of observing the sexual forms of a species of *Dero*, which I identify with *D. perrieri*. A large number of these Annelids made their appearance in some water-cress containing *Chara* which I received from Messrs. Bolton of Birmingham; at the end of August all, or nearly all, were sexually mature. As there appears to be no account of the reproductive organs of this worm extant, I think it worth while to publish the present notes. Except as regards the sexual organs, they are for the most part confirmatory of Perrier.

The worms reached a length of about half an inch; they were extremely active in their habits, wriggling about very much after the fashion of a free-living Nematode; the colour appeared to the naked eye of a dark violet posteriorly; in front the development of the clitellum and of the sexual products produced an opaque yellowish white appearance. The eggs could be distinctly seen and counted with an ordinary hand-lens; they lie behind the clitellum; I observed the number to be almost constantly three. I have made no observations upon the tube, which, according to Perrier ("Histoire naturelle du *Dero obtusa*," Arch. Zool. éxp. t. i. (1872) p. 65) and Bousfield ("The Natural History of the Genus *Dero*," Journ. Linn. Soc. vol. xx. (1887) p. 91) are fabricated by the worms. The fact that they make for themselves an habitation of this kind distinguishes the genus *Dero* from *Nais*, to which all recent writers concur in regarding *Dero* as closely related.

The new facts which are brought forward in the present communication strongly support that view of the affinities of the worm, which may indeed now be regarded as fully established.

The general anatomy of the worm has been described chiefly by d'Udekem ("Nouvelle Classification des Annélides sétigères abranches," Bull. Acad. Roy. Belge, t. xxii. pt. 2, p. 549 *et seq.*), Perrier (*loc. cit.*), and Bousfield (*loc. cit*). Stolč ("*Dero digitata*, O. F. Müller, Anatomicka a histologicka studie," SB. böhm. Gesell. 1885, p. 65), in a paper overlooked by Bousfield and omitted from an otherwise tolerably complete list of papers dealing with *Dero*, has contributed details of importance, being apparently the first to have made use of the section method. I refrain from attempting

list of literature referring to this genus, for the reason eld has gone into the matter somewhat fully.

ently with the development of the sexual organs, certain er aquatic Oligochæta have been stated to show other s, so that there is a kind of dimorphism among the . The sexual individuals of *Dero*, in common with other a, show no traces of multiplication by budding; connected a regularity in the arrangement of the seta-bundles at the

Fig. 1.

Ventral aspect of sexually mature *Dero*.
cp., spermathecal pores; ♂, male pores.

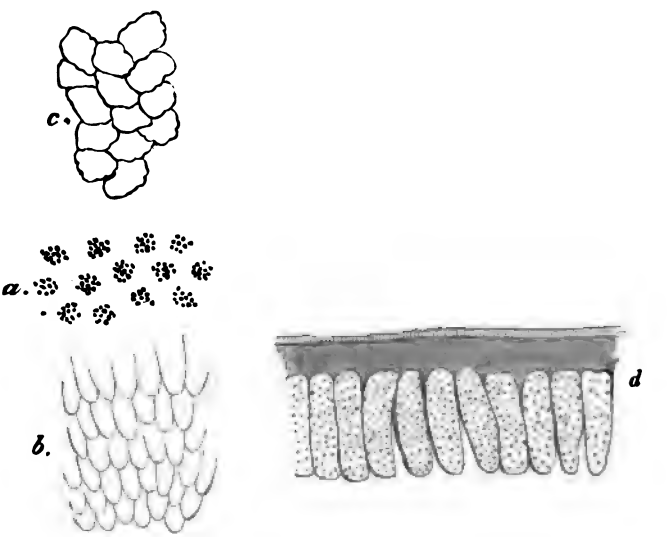
emity of the body. In the asexual form, on the contrary, nal growth of the posterior groups of setæ appears to irregularity in the disposition of the seta-bundles; the n of these, for example, in *D. perrieri* (Bousfield) (see

Perrier, *loc. cit.* pl. i. fig. 1) is not clearly defined. In the sexual individuals studied by myself the last segment was only furnished with the ventral bundles of setæ. This character may possibly prove to be of specific value.

It is of some importance to note that budding and sexual reproduction do not take place concurrently in *Dero*, since d'Udekem has asserted that they do in some allied forms.

Among the specimens of *Dero* which I examined were a few individuals which agreed in every particular with the others except for the entire absence of all traces of the branchial apparatus. There was, moreover, no appearance of any injury to this part of the body, and the segments ended off in a perfectly regular fashion. I do not believe that these individuals were a species of *Nais* or any other

Fig. 2.



Clitellar epithelium of *Dero*.

a. Showing granules in cells of developing clitellum; *b*. Fully mature cells, surface view; *c*. Fully mature cells showing crenated margin, surface view; *d*. Section showing granular coagulum which accumulates between epithelium and cuticle.

described allied genus, but I hope to be able to reinvestigate the point if I succeed in keeping the brood of *Dero* alive.

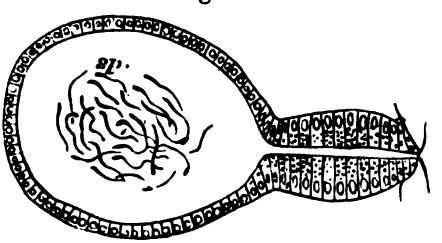
I now pass to the description of the generative organs.

Clitellum.—This modified region of the epidermis was very conspicuous in fully mature individuals by its somewhat greater opacity. Its anterior limits are as nearly as possible bounded by the apertures of the spermathecæ (see fig. 1), posteriorly it extends beyond the 5th seta-bundles; the clitellum therefore occupies three segments,

Nos. 5, 6, 7. The cells which compose the epidermis of the clitellum are much taller than those which constitute the epidermis elsewhere; they are columnar in form and loaded with granules to such an extent that the nucleus (in individuals stained with picrocarmine) was altogether invisible. In a surface-view of a fully developed clitellum the cells often appeared to project as shown in fig. 2 *b*; the cells of the clitellum are at first only occupied by a few highly refractive granules, the cell-outline being very indistinct (fig. 2 *a*). In longitudinal sections of the clitellum (fig. 2 *d*) the unstained cuticle could be easily seen; very frequently the cuticle was separated from the outer extremities of the clitellar cells by a space containing an amorphous substance, which in individuals coloured by picrocarmine solution was stained deep pink. I regard this substance as the product of the activity of the clitellar cells, destined probably for the formation of the cocoon; its accumulation between the cuticle and the epidermal cells seems to be remarkable, even if the secretion has been caused by the stimulation of the glandular cells by the preservative reagent.

Spermathecæ.—There is a single pair of these organs situated in

Fig. 3.



Spermatheca of *Dero* in longitudinal section. *sp*, spermatozoa.

the 5th segment. The apertures to the exterior are placed on the boundary-line between this segment and the 4th, just in front of the ventral setæ. These setæ were constantly two in number to each bundle; I did not observe any variation in this respect in a number of individuals. The number of setæ in the ventral bundles of the three segments anterior to the fifth I found to vary slightly, although usually three. Except as regards their apparently fixed number, the setæ lying behind the apertures of the spermathecæ were in no way different from those of other segments; as in the asexual form, the dorsal setæ of segment 5 and of those preceding it are entirely absent.

The spermathecæ were in every case distended with spermatozoa. The structure is illustrated in fig. 3, which represents a longitudinal section; the narrow duct of the pouch is lined with an epithelium of tall cells, elsewhere the cells of the lining epithelium are much smaller.

All the specimens were so fully mature that it was no longer possible to recognize the position of the *testes* and of the *ovaries*.

On the other hand, the *sperm-sac* and *egg-sac* were filled with th sexual products.

The *sperm-sac* is a single unpaired structure extending throug segments 6–8; it was filled with spermatozoa and furnished, as usual in the Naidomorpha (see Vejdovsky, 'System und Morpholog der Oligochaeten,' Taf. iv. fig. 2, *v.s*; and Štolč in SB. böhm. A 1887, p. 143), with a pair of rhythmically contractile vascular trunk

The median unpaired *egg-sac* lies behind the sperm-sac, occupyi segments 8–10; it contained 2–4 large ova with abundant yol spherules. The diameter of the largest ova was fully that of t body-cavity.

The *atria* open on to the ventral surface of the body in a li with the openings of the spermathecæ (woodcut, fig. 1, *δ*, p. 441

It has been already mentioned that there are no setæ developed the neighbourhood of these orifices; the 6th segment, which carr the atrial pores, possesses only the dorsal pairs of setæ. T apertures of the atria are larger than those of the spermathecæ, a rather more conspicuous, for the reason that they are surrounded an area upon which there are no glandular cells. The atria a lined by a columnar epithelium, but I could observe no layer of lar cells covering these organs externally and forming the struct which has been sometimes termed prostate. No doubt a fine lay of peritoneal cells is present; but this layer was not conspicuous developed as it is, for example, in *Stylaria* (Vejdovsky, *op. cit.* pl. fig. 10).

The *vasa deferentia* appear to run forwards, and to open by funnel into the 5th segment.

It is clear therefore from the brief and, in some respects, incomplete account which I am able to give here of the reproductive organs of *Dero*, that this genus agrees in all essentials with other Naidomorpha. There is no longer any room for doubt that it has been correctly referred to this family. The three other genera in which the sexual organs have been described are *Nais*, *Ophidonais*, and *Stylaria*. In all of these genital setæ are found upon the 6th segment. *Dero* differs in the absence of these structures. The form of the atrium is more like that of *Nais* than *Stylaria*; it tapers off gradually into the vas deferens, while in *Stylaria* there is an abrupt line of demarcation between atrium and vas deferens.

6. Descriptions of some new Species of Sandwich-Island Birds. By Scott Wilson.

[Received November 2, 1889.]

Chrysomitridops [1], gen. nov.

Bill moderate, conical and sharp at the tip, with culmen nearly straight and tomia slightly curved; nasal membrane very small and nearly covered with feathers. *Wing* moderate: first primary wanting; third and fourth nearly equal, and rather longer than the second and fifth; secondaries slightly mucronate at the tip. *Tail* moderate, forked, and rectrices acuminate. *Feet* slender, claws much curved.

Chrysomitridops cæruleirostris, sp. n.

Male. Bill light prussian blue, darker on maxilla. Lores black, meeting below the chin and in front, where the black passes into olive and is succeeded by an ill-defined coronal patch of gamboge-yellow, gradually shading into yellowish-olive, which extends over the whole surface of the sides of the head, neck and mantle, back, and rump, but is rather brighter on the last; lower surface gamboge-yellow, brightest on the throat, and shading into olive on the flanks. Wing-lining primrose-yellow, passing into white. Wing and tail-quills blackish brown, margined outwardly by olive and the former inwardly by greyish white, while the middle pair of the latter have most of the inner web dusky olive; irides dark hazel; feet bluish black.

Obs. The bill is certainly stouter than that of *Loxops*, but less powerful and straighter than that of *Oreomyza*, and recalls, as does the general appearance of the bird, that of *Chrysomitris*.

At present it seems doubtful whether this generic form should be assigned to the Finches or to the Honey-eaters; the slightly covered nostrils indicate the latter, but the mucronate tips of the secondary quills and, above all, the Siskin-like song seem to show a Fringilline affinity.

Dimensions. Total length 4½ inches, wing 2½, tail 2, culmen ·4, tarsus ·75.

Hab. Kauai.

Loxops flammea, sp. n.

Male. Front and sides of the head pure scarlet; top of the head and back brownish scarlet, brightening into nearly pure scarlet on the rump; chin, throat, and lower surface generally pure scarlet, but paler in hue, brightening, however, on the flanks; rectrices blackish brown edged with brownish scarlet; wing-lining pale scarlet. Bill and legs light pinkish brown.

Female. Top of the head hair-brown, but each feather brownish scarlet at the base, and the shaft of those towards the back of the

[1] *Chrysomitridis* faciem habens.

head grey; back hair-brown tinged with red, rump distinctly russet, and the upper tail-coverts brownish scarlet; remiges and rectrices blackish brown edged with brownish scarlet, as also are the upper wing-coverts. Beneath, dull white tinged with pale scarlet; sides of the body reddish brown, and wing-lining white tinged with scarlet.

Dimensions. Total length 5 inches, wing from carpal joint 2¼, culmen ·5, tarsus ·75, tail 2.

Hab. Molokai.

Obs. Differs from *L. coccinea* not only in its much larger size, but in the intense purity of its scarlet, which replaces the scarlet-orange of *L. coccinea*.

HIMATIONE MONTANA, sp. n.

Male. Forehead, sides of the face, and throat deep lemon-yellow, shading into a lighter tint of yellow on the breast and abdomen, the lower part of which is white; under tail-coverts deep lemon-yellow; upper parts, with the exception of the rump, which is yellow, are dull greenish yellow; primaries, of which the second is much shorter than the fourth and fifth, which are equal, ashy brown, edged with dull yellow; wing-lining white, tinged with clear yellow; tail-quills ashy brown edged with dull yellow. *Bill* light pinkish. *Feet* slender, of the same colour as the bill.

Female. Similar in general colour to the male, but the underparts are of a very light shade of lemon-yellow instead of the deep yellow of the male.

Dimensions. Total length 4 inches, wing from carpal joint 2·25, culmen ·35, tarsus ·70, tail 2·75.

Hab. Lanai.

Obs. The bill in curve approaches nearest to *Oreomyza* and in size to *Himatione parva*, Stejn.

HIMATIONE STEJNEGERI, sp. n.

? *H. chloris*, Stejneger, Proc. U.S. Nat. Mus. 1887, p. 96 (nec Cabanis, Mus. Hein. i. p. 99).

Closely resembling *H. chloris*, but having the bill higher at the base, more decurved, and with the maxilla perceptibly exceeding the mandible in length.

This species differs from the true *H. chloris*, of which I have been able to examine a specimen in the Museum of the University of Cambridge, marked by Prof. Cabanis as agreeing with his type. Dr. Stejneger, it will be observed, did not feel certain as to the identity of the form from Kauai and that from Oahu, whence came Prof. Cabanis's examples, and where I obtained others agreeing with them.

Hab. Kauai.

Obs. The representative forms of *Himatione chloris*, Cab., from the Islands of Lanai and Molokai, are (easily) distinguishable from each other and also from Professor Cabanis's type, which was obtained from the island of Oahu.

The following characters of the forms of this species from the three islands will serve to distinguish them :—

H. chloris (Oahu).—A trace only of a yellow mark from the bill to the eye. Upper parts of a *dark* greyish buff tinged with a faint shade of olive. Underparts whitish buff tinged with yellow. Bill and legs dark brown.

H. chloris (Lanai).—A distinct yellow mark from the base of the bill to the eye. Upper parts *light* greyish buff, distinctly tinged with olive. Beneath on the breast and throat light lemon-yellow, shading into buff on the flanks. Bill and legs lighter brown. The bill is more slender.

H. chloris (Molokai).—A distinct yellow mark from the bill to eye, as in the Lanai form. Upper parts darker than in the Lanai form, but not so dark as in the type from Oahu. Underparts yellow, but not so bright as in the Lanai form. Bill and legs considerably stouter than in the preceding form.

November 19, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions to the Society's Menagerie during the month of October 1889 :—

The total number of registered additions to the Society's Menagerie during the month of October was 90. Of these 1 was by birth, 50 by presentation, 12 by purchase, 7 by exchange, and 20 were received on deposit. The total number of departures during the same period, by death and removals, was 76.

Amongst the additions I may call special attention to the arrival of the young male Gaur (*Bibos gaurus*) from Pahang [1], one of the native States in the Malay Peninsula, presented to the Society by Sir Cecil C. Smith, K.C.M.G., the Governor of the Straits Settlements.

We are greatly indebted to Mr. W. Davison, F.Z.S., for the valuable assistance he has rendered us in shipping this animal to Europe; also to the Peninsula and Oriental Co. for their liberal grant of a free passage of the first example of the Gaur that has reached Europe alive; and to Capt. Horne, of the steam-ship 'Rohilla,' for the kind care and attention he has devoted to the animal during the passage home. Mr. Davison has supplied me with the following information respecting this specimen :—

"I am shipping the young bull 'Sladang' (*Bibos gaurus*) by the P. and O. S. 'Rohilla,' leaving here to-morrow morning for London. The animal is in splendid condition and comparatively tame—that is, he takes food readily from hand, and allows one to scratch his forehead. He was caught five months ago. There is not a question I think now about there being two distinct species of this form in the Malay Peninsula. The one now sent is about a two-year old, a bull, black, forehead grey, and stockings of all four feet dirty white. It is the 'Sladang' of the Malays, the so-called Bison of India

[1] See 'The Field' newspaper, June 1st, 1889, p. 767, for an account of the hunting and capture of a herd of these animals in Pahang.

(*Gavæus gaurus*). The other is the 'Sapio' of the Malays. It is black; but has the belly, the inner sides of both fore and hind legs, and stockings chestnut: the grey patch on the forehead is rusty, and the insides of the ears are strongly tinged with chestnut. I have seen an old bull, standing over 18 hands, with massive horns, coloured thus; and the other day Dr. E. A. Travers shot, in Jelebu, a young bull almost exactly the size of the Sladang now sent, and it was coloured exactly like the large bull. The quite young of this form are said to be entirely chestnut, and the cows to have the chestnut of the stockings, belly, and inner sides of the legs darker and richer coloured than in the bulls. There is, I think, no doubt upon the subject; the Malays, who are not likely to make a mistake in such a matter, recognize two species."

Prof. Flower exhibited the skin of the face of a male African Rhinoceros (*Rhinoceros bicornis*), shot by Sir John C. Willoughby, Bart., on the eastern side of the base of Kilimanjaro mountain. In addition to the two normal horns, it presented a third, of irregular form, placed in the median line on the lower part of the forehead.

Prof. Flower made the following remarks on this specimen:—

"The anterior horn is 13½ inches long, measured along its curved anterior surface, or 12 inches measured in a straight line from the side of the base to the apex, and is 20 inches in circumference at

Skin of face of *Rhinoceros bicornis* with third (abnormal) horn.

the base. The apex is considerably worn and polished. The b[illegible] of the second horn is, as usual, in contact with the first, and it [illegible] 2 inches shorter, measuring 10 inches along the side from base to ap[illegible] It is more upright and compressed than the anterior horn. There [illegible] an interval of 4 inches between the hinder edge of the base of t[illegible] and the front of the third horn. This supplementary horn is 5½ inch[illegible] in height and 17½ in circumference at the base, which has an irregular, unsymmetrical, somewhat triangular form. It is composed of the same fibrous structure as the normal horns, but of a coarser character, and showing a tendency to split up into columnar masses,

as well as to fray off at the sides. Its surface also shows many irregular transverse linear depressions. The apex is broad, obtuse, and fissured, and has been subjected to a certain amount of attrition. A fissure extending almost to the base separates a distinct columnar piece from the anterior and left corner of the principal mass. Although its general structure is obviously that of true horn, it appears to bear the same relation to those in front of it that a nail growing from a diseased or injured matrix does to a normal healthy nail.

"As the horn of the Rhinoceros is only a greatly modified portion of the animal's skin, specialized for its particular function by the immense development of the papillæ of the derm and the exaggerated growth of the epidermic covering, it is not surprising that under some abnormal circumstances, perhaps some local irritation of the skin, a horn should be developed on some other part of the surface from that on which they are usually found. Such an occurrence, however, appears to be rare, and I cannot recall one on record—unless the well-known figure by Albrecht Dürer, copied in so many of the old books on Natural History, of an Indian Rhinoceros with a second horn placed between the shoulders, is founded upon fact. The present specimen is certainly interesting as illustrating the method by which such structures as the horn of the Rhinoceros may have been originally developed.

"A sketch of the animal is given in Sir John C. Willoughby's lately published work on 'East Africa and its Big Game: The Narrative of a Sporting Trip from Zanzibar to the Borders of the Masai.'"

The Secretary exhibited a skin of an albino variety of the Cape Mole-Rat (*Georychus capensis*), forwarded to the Society by the Rev. G. H. R. Fisk, C.M.Z.S., of Capetown, and read the following extracts from a letter received from Mr. Fisk on the subject:—

"I send a skin, prepared for mounting, of a White Mole-Rat, a male. It was given to me alive by Mr. Hiddingh, who so kindly gave me the one which I sent to you some time ago. This one lived for about a week after capture and fed freely, giving no signs of pain; but, after death, I found that it had been too much hurt by the trap to recover the injury. I put it into the hands of a taxidermist to be properly prepared, thinking that you might like to set it up and place it near the cage of the living animal, so that visitors might gain an idea of the peculiarities of the creature."

Mr. A. Smith Woodward, F.Z.S., exhibited a fragment of the rostrum of an extinct Saw-fish, *Sclerorhynchus atavus*, kindly forwarded to him for examination by Prof. Albert Gaudry, and made the following remarks:—

"The specimen is shown, of the natural size, in the accompanying drawing (p. 450), and, like the type in the British Museum, was obtained from the Upper Cretaceous series of Mount Lebanon. It doubtless pertains to a smaller individual than the last-named fossil, and is interesting as showing the extreme slenderness of the rostrum

The broad median cartilage is distinct, very robust, displaying the numerous well-calcified tesseræ; and on either side of this the narrow area is comparatively thin, though exhibiting small tesseræ that are more suggestive of cartilage-calcifications than of shagreen-granules. The anterior extremity of the type specimen (Catal. Foss. Fishes B. M. pt. i. pl. iii. fig. 1) shows a single pair of broad

Rostrum of *Sclerorhynchus atavus*.

lateral cartilages occupying the entire width of the snout outside the median rostral cartilage; and it seems probable that a similar arrangement exists in the new specimen now exhibited. A few rostral teeth occur, of the form already described in the British Museum Catalogue.

"A third head and rostrum of *Sclerorhynchus* has lately been detected, mingled with remains of Teleostean fishes, upon a small slab from Mt. Lebanon in the British Museum (no. 53663). Though very imperfectly preserved, this fossil confirms the observations made upon the previous specimens, and also makes known the form and proportions of the teeth in the mouth. These teeth are remarkably similar to those of a Lebanon fish of which the hinder portion

of the head and the trunk are described under the name of *Squatina crassidens* (Catal. Foss. Fishes B. M. pt. i. p. 69, pl. ii.); they are broad and acuminate, compressed antero-posteriorly, and fixed upon a depressed base; the crown is marked by large vertical wrinkles, and its median portion is produced downwards anteriorly over the root. In its dentition, *Sclerorhynchus* thus approaches the living *Pristiophorus* more closely than *Pristis*, though differing from both these types in the striation of the dental crown. The arrangement of the rostral cartilages, however, is sufficient justification for still retaining the extinct Cretaceous genus in its provisional position among the Pristidæ, of which it is the least specialized type hitherto discovered."

Mr. A. P. Goodwin laid on the table examples of some rare Paradise-birds procured during Sir William Macgregor's recent expedition to Mount Owen-Stanley, New Guinea; also several photographs, comprising views of Mount Owen-Stanley, of a native bridge, and of the bowers of some species of Bower-birds met with on this occasion.

Mr. Goodwin made the following remarks:—"The most noteworthy of these birds is a pair of *Epimachus macleayanæ*, lately described by Dr. E. P. Ramsay, Curator of the Australian Museum, Sydney, in the 'Proceedings' of the Linnean Society of New South Wales, ser. 2, vol. ii. p. 239. The type specimen was obtained some two years previously by one of Sir William's party in the Maroka district. This *Epimachus* inhabits the mountain-regions of this district at an altitude of from 6000 to 9000 feet; above that no Paradise-birds were found by the party, save one Bower-bird which I will mention hereafter.

"The call of *E. macleayanæ* is a shrill double-note, similar to the sound produced by striking a pair of clappers together.

"The next bird is a female of *Astrarchia stephaniæ*, which was originally discovered in the same locality. Not having been so fortunate as to see this bird alive, I am able to give you but little information about it; but it is somewhat remarkable that no specimens were obtained after the party had been in camp two days, nor was there any adult male seen by any of the party.

"Among the photographs taken on this occasion are:—A view of Mount Owen-Stanley, taken from Mount Musgrave, at a distance estimated at eight miles; also one of a tribe of the natives who live in the mountains; and one of a native bridge, 195 feet long, which spans the Vanappa River. I also call your attention to two interesting views of Bower-birds' bowers. One of these belongs to *Amblyornis subalaris*; and the other, found at a higher altitude, up to 10,000 feet, is of a species which I propose to call *Amblyornis musgravii*. Several specimens of this bird were obtained. It is similar to, but larger than, *A. subalaris*, which was procured on Mount Belford at an altitude of 4000 feet."

A communication was read from the Rev. Thomas R. R. Stebbing and Mr. David Robertson containing the descriptions of four new British Amphipodous Crustaceans. These were named *Sophrosyne robertsoni*, *Syrrhoë fimbriata*, *Podoceropsis palmatus*, and *Podocerus cumbrensis*. Of these, *Sophrosyne robertsoni* belonged to a genus first observed at Kerguelen Island.

This paper will be printed entire in the Society's 'Transactions.'

The following papers were read:—

1. On the Subdivision of the Body-cavity in Lizards, Crocodiles, and Birds. By Gerard W. Butler, B.A. (Communicated by Prof. G. B. Howes, F.Z.S., F.L.S.)

[Received November 14, 1889.]

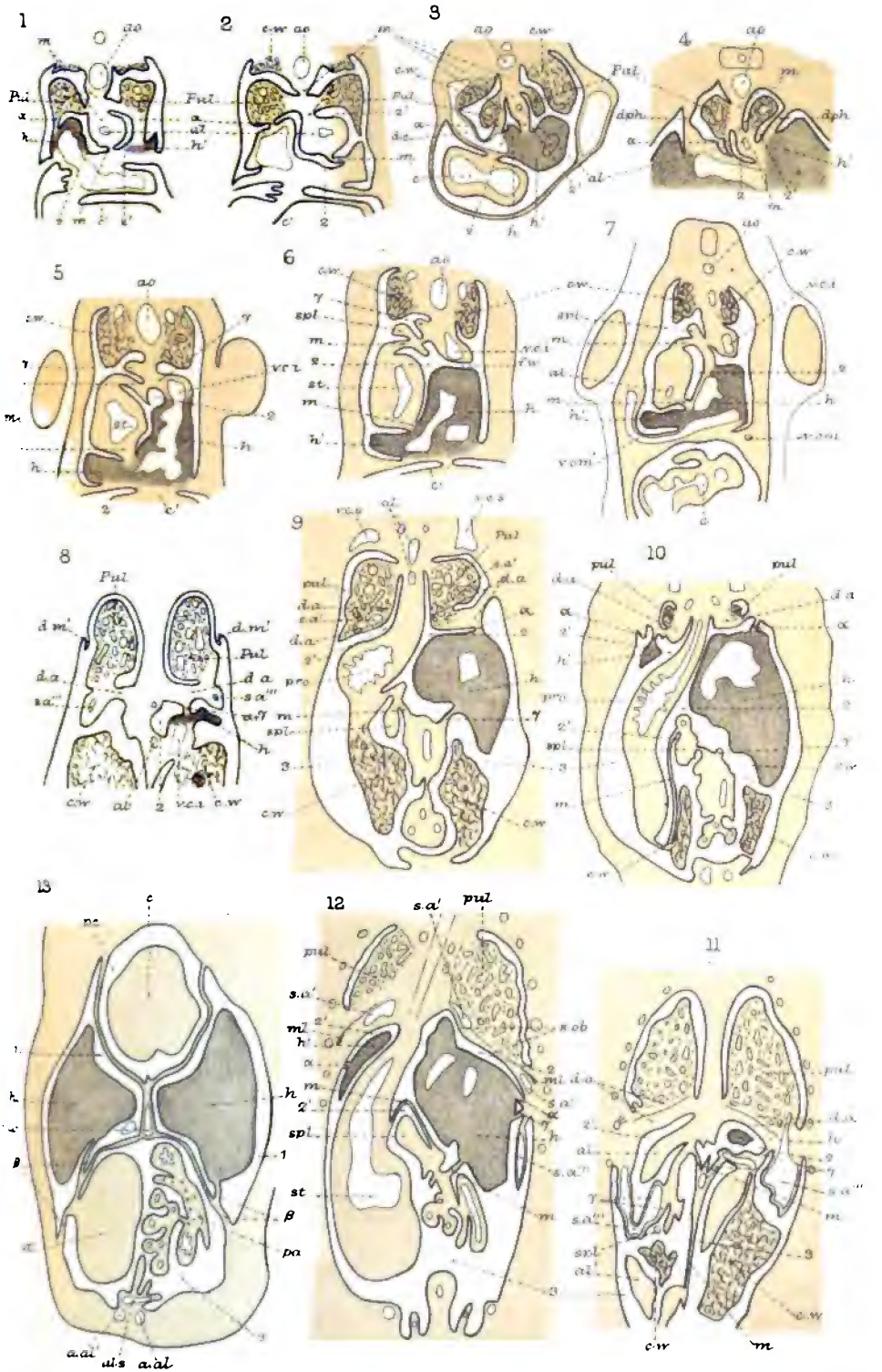
(Plates XLVI.–XLIX.)

Contents. Page

I. Introductory 452
II. On the Subdivision of the Body-cavity in the adult Fowl 453
III. On the Development and Homologies of the various Septa in the Body-cavity of the Chick 455
(*a*) On the Development of the Air-sacs in relation to the parts of the Avian Diaphragm 456
(*b*) Certain previous opinions with regard to the Avian Diaphragm. 458
(*c*) On the Development of the Pulmohepatic Ligaments and Recesses 460
(*d*) On the Homology of the Avian and Mammalian Diaphragms... 461
(*e*) On the Development of the two parts of the Post-hepatic Septum of the Bird 463
IV. On the Body-cavity of the Lacertilia and of the Teiidæ in particular. 464
(*a*) The Lacertilia generally 464
(*b*) The Teiidæ 466
V. On the Body-cavity of the Crocodilia 467
VI. Conclusions 470
VII. List of Memoirs and Papers referred to, and Postscript 471
VIII. Explanation of the Plates 472

I. Introductory.

There are embodied in this and another communication on the "Relations of the Fat-bodies of the Sauropsida" (see below, p. 602), the results of some months' work, carried on in the Biological Laboratory of the Normal School of Science and Royal School of Mines, at the instigation of my teacher, Prof. G. B. Howes. To him my best thanks are due for most of the material employed, and still more for the time and trouble which he has always been ready to devote to furnishing me with suggestions and advice. For lesser gifts of specimens I have to acknowledge my indebtedness to Dr. A. Günther, F.R.S., to Mr. G. A. Boulenger, to Prof. Wiedersheim of Freiburg, and to my fellow-student, Mr. E. W. L. Holt. Mr. Boulenger has, moreover, on various occasions kindly furnished me with welcome information.



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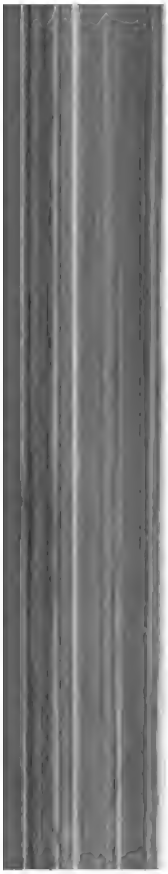

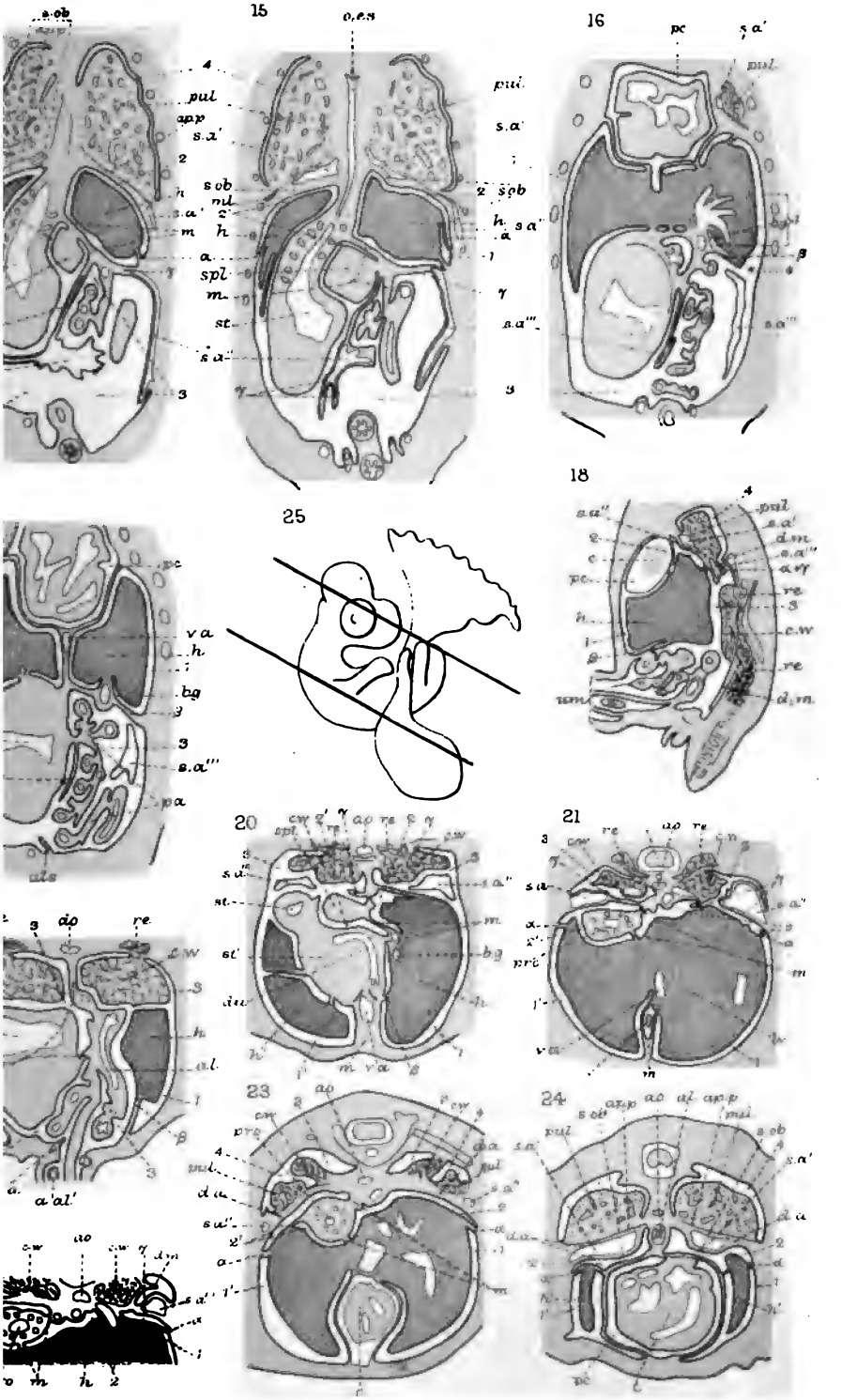

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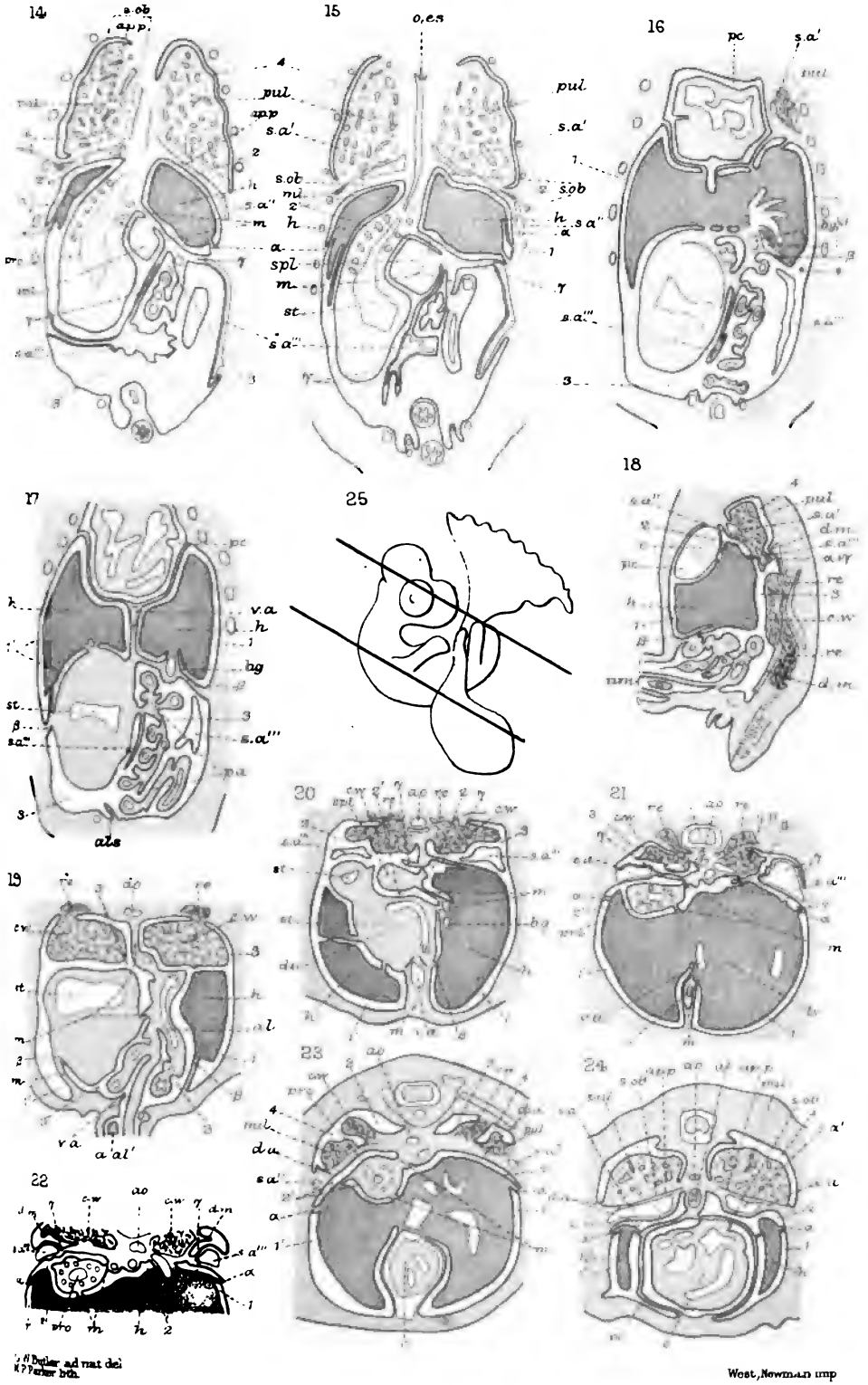

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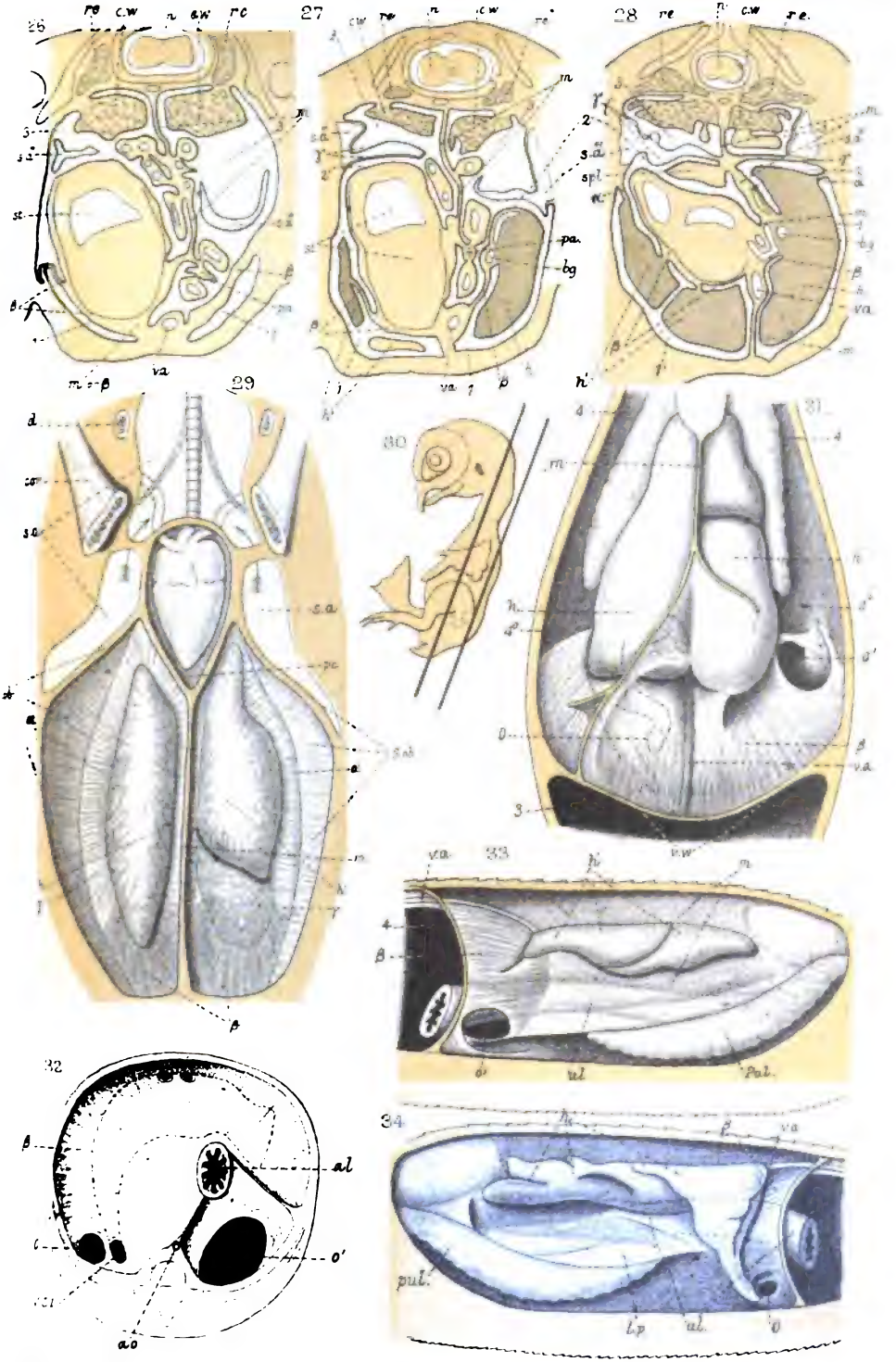

Subdivision of body-cavity. Lizards etc.

West, Newman, chr

Nothing appears to be known of the development of the subdivisions of the body-cavity in the Crocodile, and to treat the subject of this paper satisfactorily the writer should have a familiar and personal acquaintance with not only that, but with the whole corresponding course of development, in Mammal, Bird, and Lizard, so far as the partial or complete septa in the body-cavity are concerned.

I have followed the development in the chick down to the twelfth day by means of complete series of consecutive sections taken in different planes, and particularly during the latter half of this period; but I cannot pretend to an equal acquaintance with the development in Mammalia, and in common, as I believe, with other observers, I have not been able, in the case of the Lizards, to compare the development in *Varanidæ* or *Teiidæ* with that in *Lacertidæ*.

Nevertheless it may be well at the present stage to make known in a preliminary paper certain observed facts, and to indicate certain homologies which they suggest.

I append a list of the more noticeable of the papers bearing on this subject to which I have referred; but, while acknowledging indebtedness to the authors of the same, I do not attempt a *résumé* of their contents; but, except in those cases where reference is made to any of them, confine myself to sketching the facts from my own observation, and to stating the conclusions to which they appear to point.

Certain subjects, such as the later stages in the development of the Avian diaphragm, and the formation of the air-sacs, as from the sixth to the twelfth day of incubation in the Fowl, and the relations and homologies of the various ligaments and septa about the liver-lobes in Birds and Reptiles, do not seem previously to have received full attention.

The consideration of these and of certain other points seems to show that the complication of the membranes in the adult Bird and Crocodile can, to a greater extent than might be imagined, be analyzed and expressed in terms of structures found in other Reptiles, where the arrangement is simpler.

II. On the Subdivision of the Body-cavity in the Adult Fowl.

On carefully cutting away the sternum and ventral body-wall of a Duck or Fowl, we see that the liver-lobes for the most part lie in two sacs entirely shut off from the rest of the body-cavity (*cf.* Plates XLVIII. and XLIX. figs. 29 and 44–47, *h*, *h'*; 1, 1'). These sacs are bounded ventrally by the sternum, externally by the vertical portion of the "oblique septum" of Huxley (*s.ob.*), mesially by the median ventral ligament (*m*) and posteriorly by the "omentum" (β), which passes anteriorly into the hinder portion of a transverse septum (γ) ventral to the abdominal air-sacs[1]. Not much, however,

[1] Huxley appears to me to have included this transverse septum (γ) in his "oblique septum," while Perrault appears to have described the two elements β and γ (just referred to separately, by reason of their arising quite separately in the embryo) as the "*diaphragme transversal*." Sappey (1, p. 35) says, speaking of

of this latter septum enters into the dorsal wall of the sacs in question, for the anterior portion of this wall is formed by the liver-lobes (h, h') themselves, and by the ligaments (α, α) which pass from the liver to the more vertical portions of the "oblique septum." The lines of attachment of these ligaments to the oblique septum follow approximately the ventro-external margins of the lungs, where this latter membrane is apposed to them. The ligaments referred to may be called the *pulmohepatic ligaments* (α, α). I now call special attention to them because in the sequel I use them as a landmark in comparing the different types.

On cutting through the pulmohepatic ligament there is exposed, on the right side, another entirely closed sac (Plate XLIX. figs. 44, 45, 46, 2), bounded externally by the more vertical portion of the "oblique septum," dorsally by the septum (γ) above referred to, and in part by the more horizontal portion of the "oblique septum." The right liver-lobe (h, figs. 44 & 46) is attached to the dorsal wall of this sac from the point where the vena cava inferior enters it, backwards, and the sac is thus partially subdivided into two.

In the Duck, the corresponding sac of the left side appears to be quite closed; but it really communicates with the post-hepatic or intestinal portion of the body-cavity by a small aperture, which is merely closed by the left "abdominal" air-sac flapping against it.

In the Fowl, however, the continuity of this sac with the intestinal cavity is plain, its hinder end being freely open.

These two sacs in the Bird, which are partly bounded by the pulmohepatic ligaments ventro-laterally, I will call the *pulmohepatic recesses*, and their homologies will be referred to later (p. 460, § III. *c*). For a capital description of the avian diaphragm reference may be made to Sappey (1, pp. 21–26), also to the 'Comparative Physiology' of Milne-Edwards (vol. ii. p. 401) and to Huxley (4). All three accounts accord perfectly. Milne-Edwards's, in fact, differs little from Sappey's, even in nomenclature. Huxley introduces a few new terms, such as *pulmonary aponeurosis* (for the *plan transversal* or *diaphragme pulmonaire* of Sappey, the *diaphragmite antérieure* of Milne-Edwards), and *oblique septum* (for the *plan oblique* or *diaphragme thoraco-abdominal* of Sappey, *diaphragmite postérieure* of Milne-Edwards). I here use Huxley's terms for these two parts of the diaphragm. I assume that the general relations of these two membranes and their air-sacs, which he and Sappey have so clearly described, require no explanation on my part. Sappey makes it very clear that he regards the two membranes

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the abdominal air-sacs, "En bas et en avant ils s'appuient sur une cloison fibreuse qui divise chez tous les oiseaux la cavité abdominale en deux cavités plus petites, l'une antérieure, qui représente l'abdomen et qui loge le foie, l'autre postérieure, qui représente le bassin et qui loge l'estomac et les intestines; cette cloison fibreuse extrêmement remarquable dans l'autriche où elle a été décrite par Perrault sous le nom de diaphragme transversal, s'insère à toute la circonference des os du bassin, et soutient l'estomac ainsi que le tube intestinal."

It will be noted that the two sacs I am describing form only the ventral portion of the anterior cavity of which Sappey here speaks.

referred to, between which lie the two pairs of air-sacs that he calls *réservoirs diaphragmatiques* or *moyens* (*intermediate air-sacs* of Huxley), as constituting a single diaphragm; and Milne-Edwards says (*loc. cit.*), "l'appareil diaphragmatique des oiseaux se compose de deux portions ou diaphragmites." This unity of the whole apparatus, which is very apparent when the development is followed (*cf.* § III.), cannot, I think, be too clearly kept in view, especially when homologies are being discussed.

In this paper I refer to all from the anterior or dorsal face of the pulmonary aponeurosis to the peritoneum covering the posterior or ventral face of the oblique septum, as the *Avian diaphragm*, in contradistinction to the Mammalian diaphragm, with which, in agreement with Huxley's verdict, it is argued in the sequel it has little, if any, true homology.

With regard to the term "oblique septum" of Huxley. As he speaks (p. 562) of the four post-bronchial air-sacs of either side as being shut off by the "oblique septum" in a similar kind of way, I presume that he includes under this term the septum (γ in the Plates) dorsal to the liver, above referred to. At all events in using this term, I refer merely to that septum which in the Fowl is (*cf.* p. 458), so to speak, blown away from the other part of the Avian diaphragm by the growth of the intermediate, or diaphragmatic, air-sacs.

I would call this septum (γ), which on either side forms the dorsal wall of the pulmohepatic recess, and into which a large part of the abdominal air-sac projects[1], the *oblique abdominal septum*. It is true that the more lateral parts of this septum, in that they take their final form in connexion with the abdominal air-sac, might so far be held to resemble the "oblique septum" proper, in its relation to the diaphragmatic air-sac; but this would not apply to the more median parts of the septum (γ), and the nature of the two things is really very different. That which I have termed the *oblique abdominal septum* does really separate one part of the body-cavity from another, as described by Sappey (footnote, p. 454 above), and is covered on both sides by peritoneum; but the "oblique septum" is only part of a cœlomic septum, the other part being the pulmonary aponeurosis.

The *oblique abdominal septum* we might perhaps regard as a backward continuation of the *whole avian diaphragm* with the abdominal air-sacs between its dorsal and ventral laminæ, just as the intermediate or diaphragmatic air-sacs lie between the two laminæ of the latter.

III. On the Development and Homologies of the various Septa in the Body-cavity of the Chick.

We may now turn to consider the development of the septa in the body-cavity of the Fowl, to which reference has been made in the preceding section.

[1] Sappey (see footnote, p. 454) says that these air-sacs *rest on* (s'appuient sur) the septum in question; but it is more correct to say that they *project into* it, in the end, as it were, blowing away a dorsal lamina from the rest.

No attempt will be made to go over the work that has been done on the earlier stages of the chick down to the 6th day of incubation, but rather to consider the light thrown on the adult condition by the subsequent stages of development [1].

The changes going on, *for the most part synchronously*, in the chick between the sixth and twelfth days may be grouped, so far as the subdivision of the body-cavity is concerned, under the following heads [2]:—

(A) The completion of the *avian diaphragm* and the development of the "diaphragmatic" and "abdominal" air-sacs (*s.a'*, *s.a''*, and *s.a'''*).

(B) The development of the *oblique abdominal septum* (γ), partly in connexion with the growth of the "abdominal air-sacs."

(C) The lateral extension of the ventral ligament of the stomach and hinder part of the liver (avian "*omentum*," β), so that meeting the *pulmohepatic ligaments* (α) and the *oblique abdominal septum* (γ), it on the one hand helps in the closing of the ventral liver-sacs (1, 1), and on the other in the formation of a *post-hepatic septum* ($\beta+\gamma$) ("diaphragme transversal" of Perrault), which is, however, not complete on the left side.

(D) The assumption of their final form and relations by the *pulmohepatic recesses* (2, 2') and *ligaments* (*a*, *a*).

III. (*a*). *On the Development of the Air-sacs in relation to the parts of the Avian Diaphragm.*

On the 8th day, while the passages between the pleural and peritoneal cavities are widely open, the abdominal air-sac first

[1] The following remarks, however, may be added with regard to the shutting-off of the pericardium. The works referred to at the end of this paper, and others, seem to show that the shutting-off of the anterior portion of the pericardial and pleural cavities from each other arises in a similar way in Mammals and Birds, in connexion with the ducts of Cuvier; while, on the other hand, such similarity cannot be claimed for the two classes in the matter of the closing-off of the posterior part of the pericardium from the rest of the body-cavity. In birds the closing-in of the pericardium posteriorly and postero-dorsally takes place, it appears, comparatively late; and finally in the adult we have the pericardium bulging into the peritoneal cavity, with little besides the peritoneum covering its postero-dorsal surface. In connexion with this subject, reference may be made to the recent paper by Strahl and Caruso (9), where it is stated that in Mammals the part of the body-cavity which later, forms the pericardial and pleural cavities arises distinct from the rest in the region of the "proamnion," and that it becomes secondarily connected with the posterior part of the cœlome (a subsequent separation of course taking place). These observers assert, as a further noteworthy distinction between that portion of the cœlome which in Mammals forms the pleural and pericardial cavities, and the corresponding part in Birds, the fact that in the former it *is* closed laterally, or on what is, when folding round of the sides takes place, the ventral side, whereas in the latter it is not so closed, but passes off into the extraembryonic cœlome. Thus from the first the thoracic cavity would seem to be much better marked off in the case of Mammals than in that of Birds.

[2] The references in brackets are to the parts so indicated in the various figures on the Plates.

becomes observable as a bronchial cavity at the outer postero-dorsal corner of the lung. It lies in the mesoblastic tissue, which later develops into the avian diaphragm ("pulmonary aponeurosis" + "oblique septum"), but which at this date cannot be distinctly marked off from the mesoblast of the lung itself.

During the first half of the 9th day (see Plate VIII. fig. 8) the abdominal air-sacs (*s.a'''*) have the appearance of oval cavities within somewhat conical outgrowths of the diaphragmatic mesoblast (*d.a*).

At the beginning of the 10th day, when the separation of the pleural and peritoneal cavities is about completed[1], the abdominal air-sacs project to a considerable extent posteriorly into the peritoneal cavity (*cf.* figs. 11, 12, and 20, *s.a'''*), while more anteriorly (*cf.* left side of fig. 11 and figs. 21 and 22) they lie within the ***oblique abdominal septum*** (γ, γ), which assumes its final form only in connexion with them.

At the beginning of the 12th day (*cf.* figs. 14, 15, 27, and 28) we find that the abdominal air-sacs not only have increased in size and extended more into the septum referred to, separating its two layers of peritoneum, but that they have begun to, as it were, strip off the peritoneal covering of the body-wall by extending behind it; and this process goes on till in the adult (*cf.* fig. 47) comparatively little of the peritoneal lining of the intestinal portion of the cœlome remains applied to the body-wall.

The first beginnings of the "anterior-" and "posterior-intermediate" air-sacs are not quite so easy to trace. The former is conspicuous in the latter half of the 8th day, and both can be made out on the 9th. (The anterior intermediate sacs are shown in fig. 9, *s.a'*.)

At the beginning of the 10th day when, as stated above, the ***avian diaphragm*** forms a complete partition, one can, in stained sections, distinguish two layers (which do not, however, exactly correspond to the two diaphragmatic septa of the adult) (*cf.* figs. 11, 12, and 24). In the region of the ribs the muscles (*ml*) of the future pulmonary aponeurosis, or "costopulmonary muscles" of Huxley, are indicated, and from this region a darkly staining layer extends inwards to the middle line passing dorsal to the œsophagus (*cf.* fig. 24, *ap.p*). This darkly staining layer together with the above mentioned developing muscles indicates the "pulmonary aponeu-

[1] It must be remembered that the dates in the case of the development of the chick are not absolute indices. As is well known, the rate of development under artificial incubation may differ considerably from that under a hen, and also in the case of different eggs artificially incubated. I have seen the peritoneal not closed off completely from the pleural cavities in a chick said to have been artificially incubated for 11 days; and this agrees with Uskow's observations (5, p. 205). He remarks that a connexion between the pleural and peritoneal cavities exists on the 12th day. Yet, in the specimen naturally incubated, 9 days 1 hour (beginning of the 10th day), of which longitudinal horizontal sections are shown in figs. 11–13, no such connexion was to be made out in a continuous series of sections. So far as the stages illustrating the development of the air-sacs go (8th–12th days), I have taken as my standard a series of naturally incubated embryos.

rosis," while the "intermediate" or "diaphragmatic" air-sacs lie posterior to this in a layer of tissue which, at this stage, forms the thicker element of the *avian diaphragm*.

At the beginning of the 12th day (*cf.* Plates XLVI., XLVII. figs. 14 and 15) we find that these air-sacs have increased in proportional size. Compare, for instance, the relative extent of the anterior diaphragmatic sacs (*s.a'*) in figs. 12 and 15, which are taken through an approximately corresponding region of embryos of the 10th and 12th day respectively.

As these air-sacs develop, they, so to speak, split the layer of the diaphragm in which they lie, part going, with the darkly staining layer and tissue in front, to form the "pulmonary aponeurosis," and part, that lies postero-ventrally to the air-sacs, forming the "oblique septum." In the end the two air-sacs referred to come into contact, and any membranous diaphragmatic tissue that may lie between the apposed walls is quite insignificant.

The avian diaphragm is thus seen to be completed as a single structure, and its separation into its two laminæ is a secondary detail arising in connexion with the development of the two pairs of intermediate or diaphragmatic air-sacs, which first penetrate it at a time when no distinct line can be drawn between the tissue that goes to form it and that of the developing lung itself.

III. (*b*). *Certain previous Opinions with regard to the Avian Diaphragm.*

With regard to the question of the homology, if any, between the Mammalian and Avian diaphragms, Sappey, whose most excellent monograph on the respiratory apparatus of the adult bird (1) was published in 1847, expresses his opinion as follows (p. 21):—"Dans les oiseaux le diaphragme comprend deux plans qui se confondent à leur point de départ, mais s'isolent bientôt pour suivre l'un une direction transversal, l'autre une direction oblique." ..... "Le premier a pour analogue dans l'homme et les mammifères toute la partie de ce muscle qui s'insère à la face interne des côtes; le second représente les piliers du diaphragme;" and he gives his reasons for regarding the attachment of the paired partly muscular fibrous tracts in the anterior dorsal region of the oblique septum as homologous with those of the pillars of the diaphragm to the lumbar vertebræ. The presence or absence and the distribution of muscle-fibre seems to have considerable weight with him and others in dealing with questions of homology[1]; and with this the questions of nerve-distribution must be also considered.

With regard to this latter, Sappey says (1, pp. 25 and 26) that (what Huxley afterwards called) the "pulmonary aponeurosis" is supplied from the intercostal nerves, and suggests that this mode of supply is similar to that by the phrenic nerve, both being by branches

[1] The question is apt to present itself, however, is muscle-fibre of great importance in such a case? Might we not have a septum homologous to the mammalian diaphragm without any muscle developed in it at all, simply consisting, so to speak, of the pleural and peritoneal membranes back to back?

from spinal nerves; while the nerves that supply the muscle in the antero-dorsal region of the "oblique septum" seem comparable to parts of the sympathetic of Mammals, in which group the diaphragm is partly supplied from the solar plexus[1].

Uskow (5, p. 214), in giving a *résumé* of the different types of diaphragm, says that the condition in Man is like that in the Rabbit, except that a part of the diaphragm is fused with the pericardium; and that the diaphragm of the Fowl is the same as that in Man, but the diaphragm has no muscle, and its ventral portion is entirely fused with the substance of the pericardium.

I do not, however, think, in the light of the clear description he gives elsewhere of the important differences between the mammal and bird, in the regions of the diaphragm (see below p. 462), that such remarks are necessarily to be taken as implying a belief in an approximate morphological homology.

Huxley, on the other hand (4, p. 567), says "neither in Apteryx nor in any other bird has either of these [pulmonary aponeurosis and oblique septum] the slightest real resemblance to a Mammalian diaphragm. For, as has been seen, the heart lies altogether behind both, and the muscular digitations of the pulmonary aponeurosis are supplied by the intercostal nerves, the phrenic being absent. The vertical and oblique septa[2] really answer to the fibrous tissue of the posterior and middle mediastinum in Mammals. In this, as in all other cases, the meaning of ornithic peculiarities of structure is to be sought, not in Mammals but in Reptiles." And he goes on to mention certain avian characteristics which are elsewhere only represented in Reptiles, and to compare the Crocodile with the Bird.

Huxley's verdict on the question of the diaphragm, as thus tersely stated, failed to remove the suspicion that while the more central part of the avian diaphragm doubtless corresponded to mediastinal tissue, a considerable portion thereof, more lateral in position, might be homologous with the diaphragm of Mammals. And it was only after reading Ravn's paper (9), in which, pp. 139–147, he goes at some length into the development of what His

[1] A rather similar line of reasoning occurred to the writer independently. For instance, in investigating the nature of the nerve-supply, the question at once presented itself—Where is one to look for the homologue of the phrenic nerve? What is the phrenic nerve? In Mammals it appears as a specialized trunk (supplying a specialized muscle), composed of factors from a rather indefinite number of spinal nerves of the cervical region. But seeing that there is this indefiniteness, and that the division into regions (thoracic, cervical, &c., &c.) of the vertebral column in Birds and Mammals is so very different, a definite answer was not reached. I was rather inclined, however, to regard as possibly to be reckoned in the same series with the phrenic nerve, those nerves which are connected with the spinal nerves in the thoracic region (of the Duck) rather after the manner of the sympathetic, and which, I presume, are the nerves referred to by Sappey, in his second category, as supplying fibres to the "oblique septum." In spirit-specimens, however, I did not detect any nerve-fibres passing from them to that structure.

[2] It will be noticed that he does not refer to the pulmonary aponeurosis with the oblique septum as homologous with the mediastinal tissues.

named the "recessus superior sacci omenti" in Mammalia, whose homologues in the Bird are much more conspicuous, that it occurred to me that these recesses and their bounding walls might serve as landmarks, and enable us more definitely to contrast the diaphragmatic structures in the two classes (*cf. infra*).

III. (c). *On the Development of the Pulmohepatic Ligaments and Recesses.*

In this connexion it will be convenient to consider the developmental changes in the chick classed under head (D) on p. 456.

Referring to figures 1–4 (of which 1 and 2 are transverse sections of a 6th-day chick, 3 of an embryo of *Lacerta vivipara*, 4 of an embryo mammal [1]), we see running down the centre of the sections the median vertical sheet of tissue (*m*) which in all the types under consideration forms a complete vertical septum in the thoracic and anterior abdominal regions. On either side of it are set the lungs and the two halves of the liver, while the alimentary canal runs in its midst.

It will further be noted that in all three cases the right liver-lobe is attached to the lung of its own side by a vertical ligament (α), which closes on the outside a space (2). The latter is blind anteriorly and opens into the general peritoneal cavity behind.

In fig. 1, which is a section anterior to fig. 2, we see that in the chick there is, on the left side also, a corresponding ligament (α') and included recess (2'), while in the case of the Mammal and (in this instance) of the Lizard there is no such ligament traceable on the left side, and therefore no recess, properly speaking, though 2' in figs. 3 and 4 marks where it should be. Now the recess on the right side (2) is the "recessus superior sacci omenti" of His, quoted by Ravn (9, p. 141), and the ligaments (α) are those which in the Bird can be clearly traced developing into the *pulmohepatic ligaments*; while the recesses, with the addition on the right side of all that remains of the omental sac proper, develop into the *pulmohepatic recesses*.

According to Ravn (*op. cit.* figs. 15, 16, and text) this "recess on the right side is continuous with the main omental sac as late as about the 15th day in the Rabbit, but by the 17th day (p. 146) it has become constricted off from the latter cavity and persists as a separate closed peritoneal sac, which comes to wrap round the œsophagus.

By a reference to the Plates, the development, in the chick, of these *pulmohepatic recesses* and *ligaments* may be followed. Figs. 1 and 2 are transverse sections of the 6th day (and the relations are much the same even on the 4th day). Figs. 5, 6, 7 may be called transverso-longitudinal sections (*cf.* fig. 25) of a 7th day embryo. Of these fig. 6 shows the foramen of Winslow (*f. W.*) leading from the main peritoneal cavity into the sac (2) of the right side, part of which corresponds to the omental sac of Mammals.

[1] See also figs. 6–9, 11, 12, 14–18 of Ravn's paper (9).

Figs. 8, 9, and 10 show this right-hand sac at the beginning of the 9th day, and we see (fig. 10, *f. W.*) that the foramen of Winslow is still open. But on the 9th day this foramen becomes closed (that is, I could find no aperture in a complete series of sections of a chick of 9 days 1 hour incubation), and moreover that part of the recess which surrounds the gizzard, as opposed to the œsophagus, becomes obliterated[1] (compare fig. 12, 2, with fig. 10, 2),

This space (2), which can be followed through the sections of the 12th day (*cf.* figs. 14–17 and 26–28) and seen in those of the adult fowl (figs. 44–46), corresponds, as stated, to rather more than the "recessus superior sacci omenti" of Mammals, since its posterior part represents a portion of the omental sac. For this reason, and because there is a similar space on the left side (where there is no omental sac to have a recess), and because these spaces are in fact no mere diverticula of the omental sac, but have a distinct origin, I have spoken of them as the *pulmohepatic recesses* (*cf. ante*, p. 454). This name expresses their relation to the liver and respiratory organs, and to the pulmohepatic ligaments which form part of their outer wall.

In the fowl the foramen of Winslow up to the 9th day, when it closes, has precisely the same relations as in Mammals, being bounded by the inferior vena cava antero-dorsally, and the duodeno-hepatic omentum, or ventral mesentery that bears the bile-ducts and portal vein, postero-ventrally.

With regard to the corresponding recess on the left side (2′ in the figures previously referred to), a reference to the figures shows that it is from the first in much freer communication with the rest of the peritoneal cavity than that on the right, and the alimentary canal, instead of (as in the case of the other recess) bending round to form, together with the median vertical membrane that supports it (*m*, figs. 9, 12, 14, 15), a posterior or omental wall, appears rather on the contrary to hinder the development of its outer wall by leaning over on the left side between the lung and liver.

III. (*d*). *On the Homology of the Avian and Mammalian Diaphragms.*

On considering the relations of the recesses and ligaments (2, 2′, *a*, *a*) in the two above-named groups, we see that the whole of the Mammalian diaphragm lies laterally or centrifugally to the attachments (*a*, *a*) of the liver to the mediastinal tissues in front of it, while the *avian diaphragm* lies practically entirely within or centripetally to these attachments. So that the condition in birds is expressed by saying that the middle mediastinal tissue of the two sides, instead of coming to wrap round the pericardium, diverges posteriorly and ventrally to become attached to the lateral body-walls[2].

[1] Apparently by constriction off from the rest and the adhesion of its walls.

[2] We may, for illustration, compare the middle mediastinal tissue of birds in its relation to the pericardium to a coat which, instead of being buttoned across the chest (the pericardium), is extended like a wing on either side by laying hold of the front bottom corners.

According to this view, the "avian diaphragm" corresponds, as Huxley says of the oblique septum, to the middle mediastinum of Mammals. The pulmohepatic recesses form a pair of spacious sacs (instead of a single minute one), and the liver is attached to the mediastinal tissue by the pulmohepatic ligaments quite laterally (instead of merely round the œsophagus) along a line on either side very close to that of the attachment of the avian diaphragm itself to the body-wall.

When following the completion of the partition between the pleural and peritoneal cavities of the bird, one observes a ridge which is connected with the Müllerian duct extending inwards from the body-wall to meet the outwardly extending mediastinal tissue. This is at once suggestive of the membrane bearing the Müllerian duct, or its continuation, which in the Amphibia and Lacertilia extends obliquely forwards along the lateral body-wall and ends near the ventral line of division between the lungs and liver. But although the *avian diaphragm* does become attached to the body-wall along the line of attachment of the embryonic Müllerian duct, the fold in connexion with the latter takes, if any, but a comparatively insignificant part in the closing-off of the pleura from the peritoneal cavity.

Uskow (5, p. 204[1]) expressing himself in terms of "Massa transversa"[2] and "Massa longitudinalis"[3], calls attention to just the points of contrast between Birds and Mammals that have been referred to above, viz. the lateral attachment of the liver, the outward diverging postero-ventrally of the mediastinal tissue, with the consequent dorsal as well as lateral projection of the lungs. He notes that the liver projects freely into forwardly extending portions of the peritoneal cavity (pulmohepatic recesses); and he finally states the fundamental difference between the central portion of the diaphragm of the chick of 7 days and the rabbit of 14 days to lie in the fact that in the former it goes with the lungs and in the latter with the liver. But, as remarked above, he goes on rather to compare than contrast the two types of diaphragm, saying (p. 205), when describing a comparatively late stage) so far the rabbit and

[1] "Nicht so bei Huhn. Hier hängt die Massa longitudinalis mit der transversa nicht im medianen Bezirke, sondern nur rechts und links zusammen mit je einem Schenkel. . . . . Sie gleicht also einer medianen Leiste, welche caudalwärts sich in 2 schenkel spaltet; diese fassen einen Kopfwärts vorgeschobenen zipfel der Peritoneal höhle zwischen sich. In diesem zipfel liegt die dorsal fläche der Leber frei. . . . . Nimmt man noch hinzu, das die Lungen in der so beschrankten paarigen Höhle der Pleura nicht nur an den Sagittalrand der massa longitudinalis, sondern vornehmlich auch an die Dorsalfläche der beiden seitlichen Schenkel der Letzteren befestigt sind, so ergibt sich das es nicht leicht ist in den eben erwähnten Bildungen das Mittelstück des dorsalen diaphragmas des Kaninchens wieder zu finden. . . . . .

"Der ganze unterschied zwischen der Entwickelung des Huhns und des Kaninchens kann demgemäss für diese Periode so formulirt werden: Beim Kaninchen legt sich das mittelstück des dorsalen Diaphragmas längs der Dorsalfläche der Leber, beim Huhn längs der Ventralfläche der Lungen an."

[2] Defined *l. c.* p. 171.

[3] Defined *l. c.* p. 172.

the chick are fairly similar, and (p. 214) giving the *résumé* from which a quotation has already been made (p. 459).

III. (*e*). *On the Development of the two Parts of the Post-hepatic Septum of the Bird.*

We have now to refer to the developmental changes grouped under heads B & C (p. 456).

First, with regard to the development of the "*oblique abdominal septum.*"

Ravn (*op. cit.* p. 140) calls by the name of "vena-cava-falte" or "plica venæ cavæ" the ridge that occurs in Mammals as a backward continuation of the embryonic lung-substance, because through it the vena cava inferior passes on its way from the kidneys to the liver and heart. But it will be seen on reference to the Plates, figs. 5 & 6, which together with fig. 7 show three sections of a chick of 7th day[1], that there is a horizontal ridge of the same nature on the left side also (γ, γ), where of course there is no vena cava inferior.

Later stages in the development of this septum are shown in the series of transverse sections of embryo of 10th day (figs. 20, 21, 22, γ, γ), and in the transverse sections of 12th day (figs. 27 & 28, γ, γ).

It will be seen that the growth of the abdominal air-sacs has considerable influence on the development of this septum, into which they extend from its outer anterior border. We may say in fact that though a starting-point is supplied by the ridge (γ) which is visible as a backward continuation of the pulmonary mesoblast in the earliest stages, it is only when the abdominal air-sacs have attained some degree of development (as at about the time of the completion of the avian diaphragm, 9th to 10th days), that a true septum reaching from the lateral walls to the median vertical mesentery (*cf.* fig. 22, γ, γ) is apparent and begins to extend posteriorly and obliquely ventralwards.

This oblique abdominal septum, or anterior and dorsal portion of the *post-hepatic septum*, is shown in its adult relations in figures 45 and 46, γ, γ (transverse sections).

The ventral part of the latter is formed by the laterally extended ventral ligament of the gizzard and hinder part of liver, which goes by the names of gastrohepatic ligament and the great omentum.

We see this membrane in the longitudinal-vertical section of 10th day (taken to the right of the middle line, wherefore the gizzard does not appear) (fig. 18, β) extending from the ventral body-wall to the posterior side of the liver. It is shown also in figs. 13, 17, 19, 20, 26, 27, 28, and also in 29, β, β. Further, I would call attention to fig. 16, which is a longitudinal-horizontal section through the more dorsal part of the gall-bladder (*b.g*) and the antero-ventral corner of the lung (*pul.*) of a chick of the 12th day. On the right

[1] Owing to the curvature of the embryo at that date, these are partly horizontal-longitudinal and partly transverse. They are very similar to figures 581 and 582 in Duval's Atlas; but the latter fail to show the presence of the ridge γ on the left side.

side there is still a communication (*) between the hepatic and post-hepatic parts of the abdominal cavity; and comparing this with figs. 15 & 17, which represent sections respectively dorsal and ventral to the section in fig. 16, it will be seen that the more dorsal part of the *post-hepatic septum* is composed of the *oblique abdominal septum* (γ), while the more ventral part consists of the lateral "omental" extension (β). On the left side the ventral and dorsal components of the *post-hepatic septum* never meet, and there is always in the fowl a free communication between the "pulmohepatic recess" of this side and the general intestinal cavity. In the duck this is reduced to the condition of a small aperture (*cf. suprà*, p. 454).

With regard to the origin of this post-hepatic septum, it would seem that the ventral portion (β) is, so to speak, started by the vitelline veins which cause considerable inward projections of the lateral body-walls in which they run. With the closing-in of the body-wall in the region of the umbilicus, the vessel of the left side which alone continues as the allantoic vein (or in the adult as an anterior abdominal vein carrying blood from the fat-laden omentum) comes to assume a more central course, but the ventro-lateral attachment of the membrane which supported these vessels persists.

The dorsal component (γ) of the *post-hepatic septum*, on the other hand, is due to the extension laterally and posteriorly, by the growth of the abdominal air-sacs, of the ridge that forms a backward continuation of the pulmonary tissue of either side. And it is thus that I believe that in those Sauropsida which have no similar arrangement of air-sacs the post-hepatic septum, which may be present (Crocodiles and Teiidæ), is the homologue of the ventral component of this septum in the bird—the dorsal part being merely represented by the membranous fold, which in many Lizards extends for a considerable distance behind the lungs.

IV. On the Body-cavity of the Lacertilia and of the Teiidæ in particular.

(*a*) *The Lacertilia generally.*

Turning now to the Lacertilia and recurring to the question of the ventral attachment of the lungs. The *left* lung seems to have, as a rule, its ventral border but slightly if at all attached, but there is sometimes a short ligament connecting this with the liver or tissue in front of that organ.

The right lung, on the other hand, seems as a rule (*cf.* p. 465, fig. A) to have its whole ventral border attached to the dorsal wall of the right liver-lobe, or—seeing that dorsally it is attached to the middle line by another ligament—it may sometimes be rather described as set on the outer side of a membrane passing between the right liver-lobe and the dorsal part of the median mesentery. The spaces thus enclosed between the lung and its ligaments on the outside, and the œsophagus and its ligaments in the middle line, are homologous with the *pulmohepatic recesses* of birds above described

V. figs. 1–4 and woodcut A, p. 465), and
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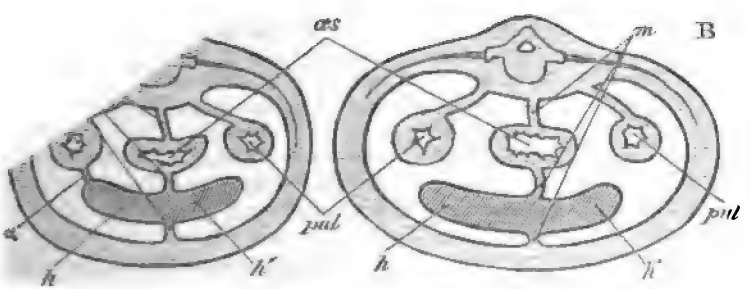


Fig. A. Diagrammatic section of one of the lizards included in the first list given above, taken through the lungs and liver.
Fig. B. A similar section of one of the Teiidæ, mentioned in the second list.
a, pulmohepatic ligament; *œs*, œsophagus; *h*, *h'*, right and left liver-lobes; *m*, median thoracic septum; *pul*, lung.

A second set of attachments of the liver frequently met with are ventral ligaments that run outwards from the pericardium, or the

[1] It may be noted that two similar types occur among the Amphibia. Thus, in the Salamander all the membranous attachments of the lungs and liver seem to be precisely similar to those in the common Lacertilian type (*e.g. Lacerta*). But in the Frog the two lungs hang freely suspended on either side, as in the Teiidæ.

median ventral ligament behind it, and take a more or less oblique course across the liver. Sometimes there is more than one such on a side.

I would call these the *oblique ligaments* of the liver.

These ligaments, when present, appear, in certain cases, to be continuous with the membranes that bear the forward continuations of the Müllerian ducts (oviducts), and are specially noticeable in the case of the Chameleon, where they form broad sheets of membrane constituting a kind of ventral diaphragm [1].

The oblique ligaments can be traced in *Lacerta*, *Uromastyx*, *Ameiva*, *Chamæleon*, and others, but their number, distribution, and degree of development is different in different forms; and I call attention to them chiefly on account of the light they may throw on the nature of certain membranes in the Crocodiles. There are in these animals (*cf.* p. 469) certain well-defined ventral ligaments of the liver, which completely mark off the more median portion of each lobe from its antero-lateral corner, and seem to correspond to these inconspicuous ligaments in the Lacertilia, but not truly to anything in Birds.

I am inclined to regard such oblique ligaments as complementary to the pulmo-hepatic ligaments; that is, to consider that they serve to unite the liver to the body-wall in those forms in which the tissue corresponding to the avian diaphragm, to which the last-mentioned ligaments are attached, does not itself become attached to the body-wall.

The more or less marked folds of peritoneum, which carry the forward continuations of the Müllerian ducts, seem (*cf.* p. 462) to mark the line along which an avian diaphragm might be expected to arise; and they probably exercise one of the functions of a diaphragm, in rendering a certain protection to the lungs; but I would not advocate any closer homology between these membranes and the diaphragms of either Birds or Mammals.

The relation of the lungs to the body-cavity in the Monitors is referred to in my paper on the "Fat-bodies," to be subsequently read, and I have nothing further to add here.

(*b*) *The Teiidæ.*

The condition in *Tupinambis teguixin* (*Tejus teguexim*, Gray) is very interesting.

We have here (*cf.* Plate XLVIII. figs. 31–34) a post-hepatic septum (β), apparently homologous with the ventral (or so-called "omental") portion of the post-hepatic septum in birds (the ventral side of which is shown in fig. 29, β), and perhaps to the greater part of the post-hepatic septum in Crocodiles (figs. 40–43, β).

This well-marked post-hepatic septum at first strikes the obser-

[1] Such oblique ligaments do in their adult relations rather suggest part of the embryonic mammalian diaphragm. They attach the liver to the body-wall posteriorly and ventrally to the attachment of the liver to the lungs or mediastinum (compare with this Plate XLVI. fig. 4, *dph.*).

as being very peculiar; but it is led up to in other genera of the Teiidæ. Thus, in *Ameiva* and *Callopistes* the median ventral ligament is, as it were, expanded laterally behind the liver, or it may be said to give off at right angles on either side a membrane which dorsally becomes attached to the hinder part of the liver.

In *Ameiva* and *Callopistes*, however, the transverse vertical septum thus formed is not continuous with the lateral walls, and there is a free passage on either side. But in *Tupinambis* (see Plate XLVIII. fig. 32, which is a view of the septum from behind, ventral side uppermost) the subdivision of the body-cavity is much more complete. On the right side there is only a very small aperture of communication (o) between the pulmohepatic and intestinal cavities. This is situated on the dorsal side external to the inferior vena cava and the attenuated extremity of the right liver-lobe, which is represented as visible through the septum. On the left side there is a larger, but still comparatively small, aperture (o') also dorsally situated.

Figs. 33 & 34 give side views, ventral side uppermost, of this post-hepatic septum (β), and the organs contained in the pulmohepatic cavity in front of it. The whole lateral body-wall next the observer is supposed to be removed. In fig. 31, on the right side (left of observer), only the ventral part of this septum is displayed, the more dorsal part lying concealed beneath this, together with the extremity of the right liver-lobe.

This post-hepatic septum I have throughout indicated by the same letter (β) as the more ventral, or omental, part of the post-hepatic septum of birds, in accord with my opinion that they are homologous; since the position of the foramen of either side seems to make it clear that there is no component growing in from the dorsal side corresponding to the oblique abdominal septum of the bird. This is just what we should expect, there being no development of abdominal air-sacs.

The difference between the adult condition of these *Teiidæ* and that of the other type of Lizard would seem to imply that the vena cava inferior of the former, instead of developing, as in *Lacerta*, *Gallus*, and *Lepus*, in tissue continuous with the posterior part of the pulmohepatic ligament, has arisen in a lateral transverse outgrowth of the dorsal part of the longitudinal median septum or mesentery, in fact in a membrane situated altogether posterior to the place where the pulmohepatic recess would lie if present.

The need of some such transverse membrane, in the absence of the pulmohepatic ligament, to carry the vena cava inferior to the liver, accounts for the dorsal portion of the post-hepatic septum in the *Teiidæ*.

To the relations of the lungs in the Teiidæ I have already referred (p. 465).

V. On the Body-cavity of the Crocodilia.

Turning now to the Crocodiles. In the absence of any data as to the development of the septa in these animals (such as we possess in

the case of Birds and Mammals), I give for what it may be worth the following interpretation, based mainly on the study of very young specimens either recently hatched or still within the egg. I have examined but one well-preserved adult specimen (of the Alligator type), and some eight or more small animals, four of which were unhatched, three of them not having yet cut their teeth, and being possessed of the horny egg-breaker on the snout.

Young animals such as these are, I think, best for making out the relations, as not only is it easy to cut longitudinal and transverse sections of them, but in the adult the true relations of the membranes tend to become obscured by adhesions or other adaptive changes, and the only drawback is the caution necessitated by the delicacy of their membranes.

That which first strikes the observer with regard to the body-cavity of a Crocodile, is the subdivision of the Pleuro-peritoneal cavity into Pulmohepatic and Intestinal portions by a *post-hepatic septum*[1]; secondly, the facts mentioned by Huxley (4, p. 568), that the gizzard is firmly connected with the body-wall, so that it appears to be itself shut off from the intestinal cavity; and that the liver projects into a number of different sacs[2].

In these three points the Crocodiles at first sight approach the Birds rather than other Sauropsida. It appears to me, however, that the Crocodiles, in the matter of the subdivision of their body-cavity, are distinctly reptilian rather than avian; and that the only satisfactory way of comparing the two types, in the absence of the much needed embryological data (*cf. suprà*, p. 453), is to analyze the complex condition of each into its component elements, and to compare these in the light of our knowledge of the simpler Sauropsida (Lacertilia), and of the development of the bird.

Fig. 35 represents one of the young Crocodiles referred to reduced one half, the lines indicating the approximate planes of the sections sketched in the corresponding figures, which are on a scale three times as large[3].

Fig. 42 is intended to show the cut edges of the pleuro-peritoneal membrane, as they would appear on the removal of the ventral bod

[1] Hunter in 'Essays and Observations on Natural History.....' (edited Owen), vol. ii. pp. 336 & 337, gives a careful account of the relations a attachments of the liver in the adult Crocodile. He emphasizes the fact that liver is shut off from the abdominal cavity, and says that it itself makes a kind diaphragm. He adds, however, that on account of the well-marked characte of the membranous lamella behind it, we may "consider the liver as in thorax."

[2] *Cf.* Owen, P. Z. S. 1831, pp. 137 and 169. I was not aware, until after t present paper was in type, that this author had described some of the anat mical features herein discussed.

[3] The longitudinal sections in question, figs. 39, 40, & 41, are drawn from t ventral side, as are also figs. 42 & 43, and also fig. 29 of the duck, and 31 *Tupinambis*. All these differ from the horizontal sections of the develop bird, which are drawn from the dorsal side. This difference being once not I hope that there will be no difficulty in making any comparisons that may desired. The transverse sections of the Crocodile, figs. 36, 37, & 38, agree with those of the developing bird, and also with figs. 45 & 47 of the adult, and 32 of *Tupinambis*, in being drawn from behind.

wall, without damage to the delicate septa and ligaments attached to and passing into it.

There appears to be a septum or "diaphragm" behind the lungs, *d.a°*, *d.a°*; but this only extends for a short distance inwards from the ventral body-wall, as is seen by comparing the figures 40 and 42, which represent the condition in the ventral region, with figures 41 and 43, which are sections through the more dorsal part. There is, in fact, a continuous pulmohepatic space 4, 4°, 4, 4°, on either side closed posteriorly by the post-hepatic septum (figs. 40, 42, and 43, β, β, and fig. 41 $\beta+\gamma$ & β). I would compare the imperfect partition (*d.a°*, *d.a°*, figs. 40 & 42) to the ventral portion of the avian diaphragm. The septum behind the liver appears to me to be homologous with the post-hepatic septum of *Tupinambis*, or with the ventral or omental part of the post-hepatic septum of the bird. And perhaps the most dorsal part near the postero-dorsal extremity of the lung and liver may represent the dorsal element (oblique abdominal septum of the bird).

But besides these lateral pulmo-hepatic cavities, there are, anterior to the post-hepatic septum, two smaller sacs on either side in the region of the liver, which must now be described.

In fig. 42 we see on either side of the median ventral ligament (*m*) a closed peritoneal sac (1, 1′) containing a portion of the liver-lobe of its side. These sacs I would roughly compare to the large ventral liver sacs in the bird (figs. 29 et var. 1, 1′). However, the lateral boundaries (*l.ob*, *l.ob*) of these spaces in the Crocodile do not seem to correspond exactly to any membranes in the bird, but to the oblique ligaments of the liver described above (p. 466) in the Lacertilia, as apparently complementary to the pulmohepatic ligaments which are represented in all three groups. The relations of these spaces (1, 1′) and ligaments (*l.ob*, *l.ob*) are further illustrated in the transverse sections (figs. 37 & 38) and in the longitudinal section (fig. 39).

The second pair of cavities in the region of the liver are specially worthy of consideration. These are the cavities 2 & 2′ on the right and left sides respectively in the longitudinal sections (figs. 40 & 43, & 41 right side) and in the transverse sections (figs. 37 & 38). I regard them as comparable to the pulmohepatic recesses of the bird. That on the left side seems to be entirely closed, and since it lies between the liver and the alimentary canal it is not bounded antero-dorsally by the lung and mediastinal tissue, and it can only be compared with the posterior and more median portion of the corresponding recess in the bird.

The space on the right side, however, much resembles the corresponding space in the bird or lizard in its relations to the liver and lung; it is bounded on the outside by the pulmohepatic ligament (figs. 37, 40, 41, 43, α), which, as in the lizard or bird, passes postero-dorsally into the membranous tract (γ, fig. 38) that is continuous with the posterior extremity of the pulmonary and mediastinal tissue (oblique abdominal septum of bird).

On the right side I found, in some of the young specimens examined, a passage between the pulmohepatic recess and the

general intestinal (or post-hepatic) cavity. In fig. 43 (which represents the dorsal half of the trunk-region of one of these small animals that had been cut horizontally), (*z*) indicates a blunt wire or "seeker" passed through this channel of communication from the post-hepatic cavity (3) to the pulmohepatic recess (2). The posterior aperture (*f.W'*) may be sometimes easily detected.

It is the position of this channel that is specially noteworthy. The opening into the post-hepatic cavity is not a proper foramen of Winslow, as is the case in the bird up to the ninth day. It lies dorso-externally to the dorsal attachment of the fatty so-called "spleen," and has the same relation to the vena cava inferior, while in the case of the foramen of Winslow the relations to the latter are the reverse of this. On the other hand, the aperture here resembles, in its relation to the vena cava inferior, the dextral foramen in the post-hepatic septum of *Tupinambis* (*cf.* p. 467, & figs. 31, 32, & 34, *o*), though in the case of this Lizard, owing to the absence of pulmohepatic ligaments, there is no corresponding recess for it to lead into (*cf.* woodcut B, p. 465).

The omental sac proper (if, as is probable, one is originally formed) would appear to have become obliterated in connexion with the tight matting together of the coils of the alimentary canal in the region of the stomach and duodenum.

I regret that I have failed to make out exactly what it is that Huxley (4, p. 568) suggests may, in the Crocodile, represent the oblique septum of birds. But if the homologies advocated in this paper be correct, the oblique septum, together with the pulmonary aponeurosis, should be represented by the tissue covering the postero-mesial face of the lungs ventrally, and on the right side forming the antero-dorsal wall of the pulmohepatic recess.

VI. Conclusions.

1. The avian diaphragm is a single structure completed as such (in the chick) about the tenth day of incubation and only subsequently divided into two parts by the growth of the "diaphragmatic" or "intermediate" air-sacs.

2. The facts described would appear to give support and definition to the view that the main part of the avian diaphragm is not homologous with the diaphragm of mammals, but with tissue, which in the latter group is called mediastinal.

3. The post-hepatic septum of the bird is composed of two parts. One, developing backwards and ventralwards from the posterior border of the lung in connexion with the growth of the abdominal air-sacs, seems to be quite rudimentary in other types which have not a like disposition of air-sacs. The other, spreading on either side dorsally and forwardly to meet the former, appears to be homologous with the greater part or the whole of the post-hepatic system of the Crocodilia, and of the *Teiidæ* among Lizards.

4. So far as the subdivision of the body-cavity is concerned, the Crocodiles seem comparable to the Lizards rather than to the Birds.

They can, however, be compared with the latter by reason of the fact that the Birds can themselves be compared with the Lizards. The Lizards would seem, so to speak, to form the nearest approach to a "greatest common measure" for the Birds and Crocodiles at present available, in the absence of much wanted embryological data with regard to the latter.

5. The family of the *Teiidæ* is noteworthy from the development, at any rate among some of its members, of a more or less complete post-hepatic septum, and for the absence of the usual attachment between the lung and liver-lobe of the right side.

VII. List of principal Memoirs and Papers referred to.

1. Sappey.—Recherches sur l'appareil respiratoire des Oiseaux. 1847.
2. Cadiat.—Du développement de la portion céphalothoracique de l'embryon. Journal de l'Anatomie et de la Physiologie, vol. xiv. 1878, pp. 630–674.
3. His.—Mittheilungen zur Embryologie der Säugethiere u. der Menschen." Archiv für Anat. u. Phys. 1881, Anat. Abth.
4. Huxley.—On the Respiratory Organs of *Apteryx* [comparing with Duck]. P. Z. S. 1882, pp. 560-569.
5. Uskow.—Ueber die Entwickelung des Zwerchfells des Pericard. u. d. Coeloms. Archiv für mikr. Anat. 1883, pp. 143–219.
6. Lockwood.—The early development of the Diaphragm, Pericardium, and Great Veins. Phil. Trans. 1888, pp. 365–384.
7. Lockwood.—Abstract of Lectures on the development of the Organs of Circulation and Respiration, including the Pericardium, Diaphragm, and Great Veins. Brit. Med. Journal, April 7, 1888.
8. Duval.—Atlas d'Embryologie. Paris, 1888.
9. Ravn.—Ueber die Bildung der Scheidewand zwischen Brust und Bauchhöhle in Säugethierembryonen. Archiv für Anat. u. Phys. 1889, Anat. Abth. pp. 123–154.
10. Strahl und Carius—Entwickelungsgeschichte des Herzens u. der Körperhöhlen. Archiv für. Anat. u. Phys. 1889, Anat. Abth. pp. 231–248.

Postscript.

While these pages were passing through the press my attention was, by Prof. Howes, directed to a paper by Ravn (Archiv für Anatomie und Physiologie, Anat. Abth. 1889, p. 412), published after the sending in of my own.

This is one of a series of papers by that author on the development of the diaphragm and adjoining organs. In it the various membranes and septa that are visible in the body-cavity of the adult male *Lacerta viridis* are carefully described with the aid of figures. He calls attention to certain membranous tissue posterior to the heart which he would regard as representing part of the more

ventral portion of the Mammalian diaphragm. Doubtless the results of the systematic research he is undertaking will be of the greatest interest, but it is only necessary for me here to refer to certain points in his nomenclature.

Ravn calls the membrane passing between the lung and the liver-lobe of the right side (the *pulmohepatic ligament* of this paper) the *ligamentum pulmonale accessorium*.

If we consider *Lacerta* alone, Ravn's term seems certainly, as a rule, the more applicable of the two; for on the left side, as well as on the right, there is a ventral ligament, which, however, passes from the lung not to the liver but to the ventral body-wall. Ravn, however, mentions that in one specimen he traced a connexion between the lung and liver by means of this ligament; and, as he says, the usual condition in *Lacerta* is probably due to the tardier development of the left liver-lobe in the embryo. In the adult of many lizards (*e. g. Sphenodon*, *Trachydosaurus*, *Uromastyx*) the ligament on the left side is either not at all or but slightly developed and does not extend as far back as the anterior margin of the left liver-lobe. And on the other hand, in *Amphisbæna*, where the left ligament is well developed, it connects the lung and liver.

I think that the more definite term which I have employed is justified, especially when we consider the homologous but more symmetrical parts in birds, where it is the liver-lobes and not the lungs that are kept in place by these ligaments; moreover, the corresponding term *pulmohepatic recesses* serves well to describe those portions of the peritoneal cavity which are enclosed laterally by these ligaments.

The membranes which I have called *oblique ligaments* of the liver, Ravn calls the *ligamentum suspensorium hepatis accessorium* (*dextrum* and *sinistrum* respectively). Ravn's term has the advantage of greater definiteness, but it is long. I may repeat that the development of these ligaments in different types of Lizard varies both as to size and number, for there may be more than one on a side. This seems to indicate that they have only a general morphological value. They are either (as Ravn calls them) *accessory* suspensory ligaments, or (as I have said above) ligaments *complementary* to the pulmohepatic attachments of the liver, in those forms where the latter are not, as they are in the bird, calculated to give sufficient support to that organ ventro-laterally.

November 23, 1889. G. W. B.

VIII. EXPLANATION OF PLATES XLVI.–XLIX.

a.al, right allantoic artery.
a.al', left allantoic artery.
al, alimentary canal.
als, allantois.
ao, dorsal aorta.
ap.p, pulmonary aponeurosis.
b.g, gall-bladder.
c, heart.
c', wall of heart.
cl, clavicle.

cor, coracoid.
c.W, Wolffian body.
d.a, *avian diaphragm*.
d.a°, representative of avian diaphragm.
d.C, duct of Cuvier.
d.M, Müllerian duct.
d.M', ligament of duct.
dph, mammalian diaphragm.
f.W, foramen of Winslow.
f.W', false foramen of Winslow.
g, genital gland.
h, *h'*, right and left lobes of liver.
l.ob, *oblique ligament* of liver.
m, median thoracic septum and abdominal mesentery and ligaments that support the alimentary canal.
ml, muscle in avian diaphragm.
o, *o'*, right and left aperture in *post-hepatic septum*.
oes, œsophagus.
ov, ovary.
pa, pancreas.
pc, pericardium.
pro, proventriculus.
pul, lung.
re, kidney.
s.a, *s.a'*, *s.a''*, *s.a'''*, interclavicular, anterior diaphragmatic, posterior diaphragmatic, and abdominal air-sacs of bird.
s.ob, *oblique septum*.
spl, spleen.
spl', fatty "spleen" (?).
t, testis.
v.a, left allantoic, or anterior abdominal vein.
v.c.s, vena cava superior.
v.c.i, vena cava inferior.
v.om, *v.om'*, right and left omphalo-mesenteric vein.
v.w, line of attachment of β to ventral body-wall.
z, seeker passed through false foramen of Winslow.
1, 1', right and left ventral liver-sacs.
2, 2', right and left *pulmohepatic recesses*.
3, peritoneal cavity.
4, pleural cavity.
4°, pulmo-hepatic portion of body-cavity.
α, *pulmohepatic ligament*.
β, ventral or "omental" portion of *post-hepatic septum* (ventral ligament of stomach and posterior part of liver).
γ, *oblique abdominal septum* (antero-dorsal portion of *post-hepatic septum*).
*, †, see text.

Figs. 1–28 are selected from complete series of sections cut with a rocking-microtome. Figs. 36–41 and 43–47 are drawings of thicker hand-made sections.

Figs. 1, 2. Two transverse sections of chick-embryo of 6th day in the region of the lungs and heart.

Fig. 3. Transverse section of embryo of *Lacerta* through same region.

Fig. 4. Transverse section of embryo mammal.

Figs. 5, 6, 7. Three transverse-horizontal sections of the chick of the 7th day drawn (enlarged) in fig. 25. Fig. 5 is nearest the shoulder; fig. 7 nearest the head and tail (all × 20).

Figs. 8, 9, 10. Three longitudinal horizontal sections of chick at beginning of 9th day of incubation, starting from the more dorsal region, seen from ventral side (all × 9).

Figs. 11, 12, 13. Three longitudinal horizontal sections of chick at beginning of 10th day, starting from the more dorsal region, seen from ventral side (all × 6).

Figs. 14, 15, 16, 17. Four longitudinal horizontal sections of chick-embryo at beginning of 12th day, starting from more dorsal region, seen from ventral side (all × 5).

Fig. 18. Longitudinal vertical section of chick about the beginning of 10th day (× 4).

Figs. 19–24. Transverse sections of embryo-chick at about beginning of 10th day (seen from behind), starting from the umbilical region and running forwards (all × 6).

Fig. 25. Outline of embryo of which figs. 5, 6, 7 show sections taken parallel to the straight lines (enlarged).

Figs. 26–28. Transverse sections of chick about beginning of 12th day (sketched from behind). The sections running forwards. (Sections at this stage through the lung-region much resembled figs. 23 & 24 all × 6.)

Fig. 29. Shows the various cavities in the trunk-region of the Duck, exposed by removing the ventral body-wall (reduced).

Fig. 30. Shows the animal (nat. size) from which the sections shown in fig. 11, 12, 13 were cut and the direction of cutting them, as well as the originals of figs. 14–17.

Figs. 31–34. Sketches of dissections of *Tupinambis teguixin* described in the text (½ nat. size).

Fig. 35. Sketch of young Crocodile (unhatched) (× ½), each line indicates the approximate position of the section whose figure has the corresponding number.

Figs. 36–38. Transverse sections of young unhatched Crocodile (seen from behind) (× 1½).

Figs. 39–41. Longitudinal horizontal sections of young unhatched Crocodile, seen from ventral side (× 1½).

Fig. 42. To show the cavities and septa displayed on removing the ventral body-wall of young Crocodile, seen from ventral side (× 1½).

Fig. 43. Longitudinal horizontal section of young Crocodile, seen from ventral side, to show the communication between the right *pulmohepatic recess* and the post-hepatic part of the peritoneal cavity (× 1½).

Figs. 44–47. Transverse sections of adult fowl; 44 and 46 sketched from in front, 45 and 47 from behind (reduced).

2. On the Lepidoptera of Japan and Corea.—Part III.[1] Heterocera, Sect. II. *Noctues* and *Deltoides*. By J. H. Leech, F.L.S., F.Z.S., &c.

[Received August 10, 1889.]

(Plates L.–LIII.)

1. Acronycta cuspis.

Noctua psi, Hübn. Noct. fig. 504.

Acronycta cuspis, Treit. Schmett. v. 1. p. 32; Guen. Noct. i. p. 43.

Var. *Acronycta leucocuspis*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 78 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 2 (1879).

Two examples, coll. Pryer. I took a specimen at Gensan in July.

[1] For Part I. see P. Z. S. 1887, p. 398; Part II. P. Z. S. 1888, p. 580.

F.W.Frohawk,lith. ad nat.

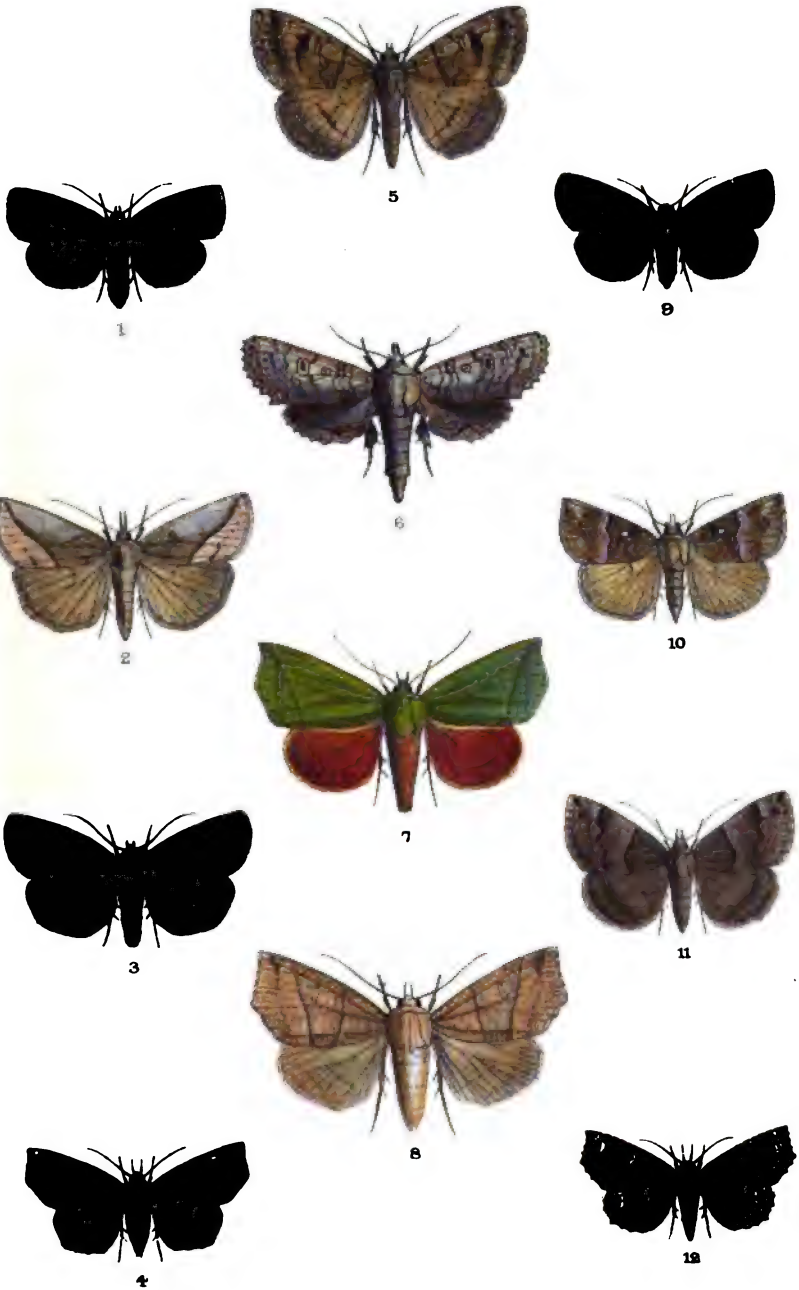
West, Newman, imp.

Lepidoptera of Japan & Corea.

F.W. Frohawk, lith. ad nat.

West, Newman & co. imp.

Lepidoptera of Japan & Corea.



P.W.Frohawk lith.ad nat.

West.Newman imp.

Lepidoptera of Japan & Corea

Rather larger and darker in colour than most of my specimens from Europe.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Gensan (*Leech*); North China; Europe.

2. ACRONYCTA TRIDENS.

Noctua tridens, Schiff. Wien. Verz. p. 67; Esp. Schmett. iv. pl. 115. figs. 5–8.

Acronycta tridens, Treit. Schmett. v. 1. 26; Guen. Noct. i. p. 43.

Acronycta increta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 78 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 3 (1879).

Several specimens coll. Pryer, labelled *A. increta*. I took examples at Gensan. In his Catalogue of the Lepidoptera of Japan Pryer says of the larva of this insect, "very like *A. tridens*, which also probably occurs here."

The largest example in my series from Japan measures 50 millim. in expanse.

Yokohama (*Pryer* and *Manley*); Gensan (*Leech*); Europe.

3. ACRONYCTA PSI.

Phal.-Noctua psi, Linn. x. p. 514.

Noctua psi, Esp. Schmett. iv. pl. 115. figs. 1–4.

Acronycta psi, Treit. Schmett. v. 1. 30; Guen. Noct. i. p. 43.

Four examples taken by myself at Gensan in June, and Fushiki in July. There were no specimens in Mr. Pryer's collection.

Gensan, Fushiki (*Leech*); Europe.

4. ACRONYCTA DIGNA.

Thalpophila digna, Butl. Trans. Ent. Soc. 1881, p. 176.

Acronycta michaël, Oberth. Etud. d'Ent. x. p. 18, pl. ii. fig. 13 (1884).

Several specimens, coll. Pryer.

I have received this species from my native collector, who took three examples at Gensan in July.

Except that the secondaries of some examples are tinged with yellow, this species has no character in common with *Thalpophila cytherea*, the insect with which Mr. Butler compares his *digna*; further it does not agree with the characters of the genus *Thalpophila*, Hübn., as diagnosed by Walker (Cat. Lep. Het. ix. p. 214), especially as regards the antennæ, which in *digna* are simple in both sexes.

Ranges from 40 millim. to 52 millim. in expanse.

Yokohama, Oiwake (*Pryer*); Corea, Sidemi (*Jankowski*).

5. ACRONYCTA HERCULEA.

Acronycta herculea, Feld. Reis. Nov. cix. fig. 2.

Acronycta luteicoma, Grote, var. *elongata*, Oberth. Etud d'Ent. x. p. 20, pl. ii. fig. 3 (1884.)

Four examples, coll. Pryer.

Yokohama, Oiwake (*Pryer*); Sidemi (*Jankowski*).

6. ACRONYCTA MAJOR.

Acronycta major, Brem. Bull. de l'Acad. 1861, t. iii.; Lep. Ost-Sib. p. 48, pl. v. fig. 7 (1864).

Tricena ancedina, Butl. Trans. Ent. Soc. 1881, p. 19.

I took this species at Hakodate and there were specimens in Pryer's collection, one of which, from the Kuriles, is a pale form with but few markings. In his Catalogue Pryer gives a brief description of this variety and proposed for it the name of *snowi*.

Tokio (*Fenton*); Yokohama (*Pryer* and *Manley*); Hakodate (*Leech*); Kuriles (*Snow*); Amur.

7. ACRONYCTA BRUMOSA.

Acronycta brumosa, Guen. Noct. i. p. 52 (1852).

Several specimens, coll. Pryer.

This is a variable species, some of the examples being dark; others are identical with typical *brumosa*, whilst one or two specimens are much paler.

Yokohama (*Pryer* and *Manley*); Gensan (*Nat. Coll.*); North America, Virginia.

8. ACRONYCTA LIGUSTRI.

Noctua ligustri, Fabr. Mant. 172; Esp. Schmett. iv. pl. 119. figs. 2–4; Hübn. Noct. pl. 5. fig. 21.

Acronycta ligustri, Treit. Schmett. v. 1. p. 20; Guen. Noct. i. p. 51.

One example, coll. Pryer.

Oiwake (*Pryer*); Europe.

9. ACRONYCTA CONSANGUIS.

Acronycta consanguis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 358 (1879).

Several specimens, coll. Pryer. I have also received the species from Mr. Manley of Yokohama, and my native collector obtained it at Hakodate in June 1887. Closely allied to *A. menyanthidis* from Europe.

Yokohama (*Pryer* and *Manley*); Hakodate, Tokio.

10. ACRONYCTA PRUINOSA.

Acronycta pruinosa, Guen. Noct. i. p. 53 (1852).

Polia soluta, Walk. Cat. Lep. Het. xxxiii. p. 723 (1865).

Plataplecta soluta, Butl. Ann. & Mag. Nat. Hist (5) i. p. 195 (1878).

Plataplecta pruinosa, Moore, Lep. Ceyl. iii. p. 5, pl. 144. fig. 3 (1884).

A fine series, coll. Pryer.

This species very closely resembles *auricoma* of Europe, but the orbicular is larger and whiter.

Yokohama, Oiwake (*Pryer*); Silhet, Java, Ceylon.

11. ACRONYCTA ALNI.

Phal.-Noctua alni, Linn. Syst. Nat. xii. p. 845.
Noctua alni, Esp. Schmett. iv. pl. 116. figs. 4–6; Hübn. Noct. pl. i. fig. 3.
Acronycta alni, Treit. Schmett. v. 1. 16; Guen. Noct. i. p. 51.

One very typical example, coll. Pryer.
Yesso (*Pryer*); Europe.

12. ACRONYCTA LEPORINA.

Phal.-Noctua leporina, Linn. Syst. Nat. x. p. 511.
Noctua leporina, Esp. Schmett. iv. pl. 91. figs. 1–5; Hübn. Noct. pl. 3. fig. 15.
Acronycta leporina, Treit. Schmett. v. 1; Guen. Noct. i. p. 46.

Two examples, coll. Pryer.
Oiwake (*Pryer*); Hudson's Bay; Europe.

13. ACRONYCTA SUBORNATA, sp. n. (Plate L. fig. 6.)

Primaries dark grey, clouded with blackish and mottled with white, double serrated basal and denticulate inner lines black with an abbreviated white band between them, the outer line is double, denticulated and curved, interspace whitish; reniform outlined in black with a central black curved line, orbicular white, outlined in black with a black centre; a short black longitudinal streak from the base and an indistinct dagger-mark at inner angle; fringes mottled grey, spotted with black at the base: secondaries fuscous grey; central spot, transverse line, and broad outer border blackish; fringes chequered black and white. Under surface of primaries fuliginous grey; costa whitish, spotted with black, central spot and transverse line black: secondaries silvery white, clouded with dark grey along the costal and marginal areas; a black costal spot unites with the central one forming a short transverse bar; central transverse denticulate line black; fringes whitish dashed with black. Head and thorax grey; patagia dark grey edged with black.

Expanse 48 millim.

Four specimens. Two, coll. Pryer, one taken by my native collector at Gensan in July and one from Yokohama.

14. PHARETRA RUMICIS.

Phal.-Noctua rumicis, Linn. Syst. Nat. x. p. 516.
Noctua rumicis, Esp. Schmett. iv. pl. 117. figs. 8, 9; Hübn. Noct. 9.
Acronycta rumicis, Treit. Schmett. v. 1. 38; Guen. Noct. i. p. 53.

A fine series, coll. Pryer.

I took specimens at several places in Japan and at Gensan in July and August, 1886. I have also received the species from my native collector, who took it at Nikko and Gensan.

Japanese specimens of *P. rumicis* are, as a rule, rather darker than those from Europe.

Yokohama (*Pryer* and *Leech*); Shimonoseki, Tsuruga, Tokio, Hakodate, Nagahama, Gensan (*Leech*); Kiukiang and Chang Yang (*Pratt*).

15. PHARETRA LONGA.

Acronycta longa, Guen. Noct. i. p. 54 (1852).

Var. *Acronycta lutea*, Brem. Beitr. zur Fauna des Nördl. China's, p. 17; Lep. Ost-Sib. p. 48, tab. iv. fig. 7 (1864).

Pharetra leucoptera, Butl. Trans. Ent. Soc. 1881, p. 595.

Several specimens, coll. Pryer. I took examples at Gensan in July, and Hakodate in August.

The colour of secondaries ranges from whitish in the type to bright yellow, var. *lutea*.

Oiwake (*Pryer*); Yokohama, Gensan (*Leech*); Amur, N. China; West Canada, N. America.

16. HYBOMA DIVISA.

Hyboma divisa, Moore, Proc. Zool. Soc. 1888, p. 409.

One example, coll. Pryer.

I took a specimen at Nagahama in July, and have since received it from Mr. Manley of Yokohama, and also from my native collector, who took examples at Nikko.

Yokohama (*Pryer* and *Manley*); Nagahama (*Leech*); Nikko.

17. HYBOMA STRIGOSA.

Noctua strigosa, Fabr. Mant. ii. 142.

Noctua favillacea, Esp. Schmett. iv. pl. 127. fig. 4; Hübn. Noct. pl. i. fig. 2.

Hyboma strigosa, Hübn. Verz. Schmett. 200.

Acronycta strigosa, Treit. Schmett. v. 1. 23; Guen. Noct. i. p. 51.

Several examples, coll. Pryer.

I took a specimen at Gensan in July, and another at Hakodate in August.

Ranges in expanse from 32 millim. to 39 millim., and seems to be uniformly larger than European examples.

Yesso, Oiwake (*Pryer*); Hakodate, Gensan (*Leech*); Europe.

18. PLATAPLECTA SUBVIRIDIS.

Plataplecta subviridis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 195 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 3 (1878).

Several specimens, coll. Pryer.

I took the species in Satsuma in May.

Yokohama (*Jonas* and *Pryer*); Satsuma (*Leech*); Chekiang.

19. GERBATHA ANGUSTA.

Gerbatha angusta, Butl. Ill. Typ. Lep. Het. iii. p. 24, pl. xlvii. fig. 2 (1879).

A fine series, coll. Pryer.

In one rather pale example the lines are very faintly defined. The specimens vary from 30 millim. to 40 millim. in expanse.

Yokohama (*Pryer*).

20. GERBATHA YPSILON.

Gerbatha ypsilon, Butl. Ill. Typ. Lep. Het. iii. p. 24, pl. xlvii. fig. 1 (1879).

One example, coll. Pryer.

Yokohama (*Pryer*).

21. GERBATHA GRANITALIS.

Gerbatha granitalis, Butl. Trans. Ent. Soc. 1881, p. 194.

Three specimens, coll. Pryer.

I took one example at Gensan in July.

Tokio (*Fenton*); Yokohama (*Pryer*); Gensan (*Leech*).

22. BRYOPHILA ALGÆ.

Noctua algæ, Fabr. Syst. Ent. p. 614 (1775).

Var. *Microphysa stictica*, Mén. Bull. de l'Acad. Pétersb. xvii. p. 315 (1859).

I took two examples at Fushiki in July, and there were several specimens in Pryer's collection.

Yokohama (*Pryer*); Fushiki (*Leach*); Lenkoran; Europe.

23. SELEPA MANLEYI, sp. n. (Plate LII. fig. 1.)

Primaries shining violet-grey, basal and costal areas tinged with greenish, discal area broadly suffused with dark grey; basal line pale, inner and outer lines black, the former is curved and indented, the latter simply curved and followed on costa by a blackish cloud bordered with whitish above inner margin; submarginal line broad, blackish, not extending to costa; the orbicular is punctiform and the reniform is represented by three dots forming a triangle: secondaries fuscous grey, darker towards outer margin. Under surface grey; primaries clouded with fuscous, two transverse central lines and submarginal band darker; secondaries with a central spot and two transverse lines dark grey, a black oblique dash near base of inner margin.

Expanse, ♂ 25 millim., ♀ 31 millim. Five specimens received from Mr. Manley of Yokohama.

Var. CLARA. The discal area is not suffused with dark grey, the transverse lines are strongly defined and double, the interspaces are white.

One specimen coll. Pryer and one Yokohama.

24. MOMA ORION.

Noctua orion, Esp. Schmett. iv. pl. 108. figs. 4–7; Hübn. Noct. pl. 5. fig. 22.

Diphtera orion, Treit. Schmett. v. 1. 50; Guen. Noct. i. p. 36.

Moma orion, Herr.-Schäff. Eur. Schmett. ii. 176. 2.

Several specimens, coll. Pryer.

I took this species at Gensan.
Yokohama, Oiwake (*Pryer*); Gensan (*Leech*).

25. Moma confusa, sp. n. (Plate L. fig. 5.)

♂. Primaries violet-grey, discal area clouded with darker; two short white basal lines; the central area traversed by two black-edged white transverse lines, which are intersected by a white streak from the base; this latter is branched and, together with the transverse line, forms a somewhat intricate network; submarginal line blackish, wavy, and sharply angulated below the costa; a white spot at inner angle: secondaries pale whitish brown, central transverse line and marginal border darker; fringes paler. Under surface of primaries fuscous, paler along inner margin, central lunule whitish, transverse line dark; secondaries whitish, with blackish central spot and fuscous transverse line.

Expanse 36 millim.
One example, coll. Pryer.
Yokohama? (*Pryer*).

26. Moma niveola.

Abrostola niveola, Motsch. Coll. Staud.
Moma tapyx, Staud. in litt.
I took one example at Gensan in July.

27. Pandesma virens.

Pandesma virens, Butl. Trans. Ent. Soc. 1881, p. 192.

A few specimens, coll. Pryer. I also received one specimen from Mr. Andrews, who took it at Hakodate, and my native collector took one example at the same place in June or July.
Yesso (*Pryer*); Hakodate (*Andrews* and *Nat. Coll.*).

28. Diphtera gemmifera.

Plusia gemmifera, Walk. Cat. Lep. Het. xii. p. 934 (1857).
Anarta gemmifera, Butl. Proc. Zool. Soc. 1867, p. 63.
Diphtera lætevirens, Oberth. Etud. d'Ent. x. p. 17, pl. ii. fig. 6 (1884).

Three specimens, coll. Pryer.
Yokohama? (*Pryer*); Sidemi (*Jankowski*); Nilgiri Hills.

29. Mythimna grandis.

Mythimna grandis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 79 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 7 (1878).
Var. *Mythimna divergens*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 79 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 8 (1878).

An extensive series, coll. Pryer.
I took specimens at Gensan in July.
This appears to be a very variable species. Some of the specimens agree with the type of *M. grandis*, others are identical with *M. divergens*, whilst others, again, resemble *M. grandis* in one character and

M. divergens in another. For instance, a specimen, which as far as regards the relation of inner and outer stripes is of the *divergens* form, has the outer stripe regularly denticulated. Another example with most of the typical characters has the reniform quite as large as any specimen of *M. divergens*.

The inner stripe is ill defined in some specimens, and in others it is entirely eliminated, whilst the outer stripe may or may not be denticulated; further, the outer stripe is, in three examples, only faintly indicated and in two others is quite absent. The colour and markings of secondaries are subject to much modification on both surfaces.

Expanse 48 millim. to 60 millim.

Hakodate (*Whitely*); Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Gensan (*Leech*).

30. MYTHIMNA TURCA.

Phal.-Noctua turca, Linn. Syst. Nat. xii. p. 847.

Noctua turca, Esp. Schmett. iv. pl. 122. figs. 5, 6; Hübn. Noct. fig. 218.

Mythimna turca, Treit. Schmett. v. 2. 181.

Leucania turca, Guen. Noct. i. p. 73.

Mythimna limbata, Butl. Trans. Ent. Soc. 1881, p. 173.

A fine series, coll. Pryer.

I took specimens at Gensan in July.

The primaries vary in colour from chestnut-brown through ochreous brown to ochreous grey; the transverse lines, usually distinct, are sometimes only faintly visible, and in one specimen from Gensan almost entirely obliterated. In this last example the median nerve and branches are whitish.

Expanse 40 millim. to 56 millim.

Yokohama, Oiwake (*Pryer*); Tokio (*Fenton*); Gensan, Hakodate (*Leech*); Kiukiang (*Pratt*); Europe.

31. MYTHIMNA RUFIPENNIS.

Mythimna rufipennis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 79 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 6 (1878).

Leucania inanis, Oberth. Etud. d'Ent. v. p. 70, pl. iii. fig. 4 (1880).

A very fine series, coll. Pryer.

Yokohama (*Jonas* and *Manley*); Oiwake (*Pryer*); Askold.

32. MYTHIMNA PLACIDA.

Mythimna placida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 79 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 15 (1878).

Several specimens, coll. Pryer.

My native collector took examples of this species at Ningpo in July.

Tokio (*Jonas*); Yokohama (*Pryer*); Ningpo (*Nat. Coll.*); Kiukiang (*Pratt*).

33. LEUCANIA FLAVOSTIGMA.

Xanthia flavostigma, Brem. Lep. Ost-Sib. p. 52, pl. v. fig. 11 (1864).

Leucania singularis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 80 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 11.

Aleta formosana, Butl. Proc. Zool. Soc. 1880, p. 675.

Var. INORNATA. (Plate L. fig. 7.)

Several specimens, coll. Pryer.

I have received this species from Mr. Manley of Yokohama, and my native collector obtained it at Hakodate in July. I took specimens at Gensan in July.

Two specimens, coll. Pryer (no. 697), differ from the type in the almost total absence of the usual markings, and the fringes are strongly tinged with pink. I have named this form var. *inornata*.

Yokohama (*Pryer* and *Manley*); Tokio (*Jonas*); Hakodate (*Nat. Coll.*); Gensan (*Leech*); Kiukiang (*Pratt*); Formosa, Amur.

34. LEUCANIA DECISISSIMA.

Leucania decisissima, Walk. Cat. Lep. Het. Suppl. ii. p. 624 (1865).

Leucania rufistrigosa, Moore, Proc. Zool. Soc. 1881, p. 337.

Leucania salebrosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 80 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 10 (1878).

One example, coll. Pryer.

Agrees with Chinese specimens, of which I have four from Kiukiang.

Yokohama (*Jonas* and *Pryer*); Kiukiang (*Pratt*); Tokio; Darjeeling, Umballa.

35. LEUCANIA EXTRANEA.

Leucania extranea, Guen. Noct. i. p. 77.

A few specimens, coll. Pryer.

Yokohama *Pryer*); Kiukiang (*Pratt*); Europe, North and South America, Africa, N. India, New Zealand.

36. LEUCANIA LOREYI.

Leucania loreyi, Dup. Hist. Nat. Lép. Fr. iv. 81, pl. 105. fig. 7 (1827); Guen. Noct. i. p. 84.

Leucania caricis, Treit. Schmett. Eur. x. 2. 91 (1835).

Five examples, coll. Pryer.

I have received this species from Mr. Manley of Yokohama.

Yokohama (*Pryer* and *Manley*); Europe, Brazil, Java.

37. LEUCANIA NIGRILINEA, sp. n. (Plate L. fig. 8.)

Primaries pale ochreous brown, radiated with pinkish between the subcostal and median nerves and clouded with blackish on the external margin below apex; a black longitudinal streak from the base to centre of wing continues after an interval as a blackish shade

to external margin; orbicular stigma represented by a black dot, another black dot precedes the reniform, which is only indicated by a white spot; a pale violet-grey shade below reniform extending towards external margin; a series of black spots arranged irregularly in two parallel transverse lines traverses the disk of the wing: secondaries pale grey-brown, darker towards external margin. Under surface pale silky grey, with a fuscous discal suffusion on primaries.

Expanse 35 millim.

One specimen, coll. Pryer, from Loochoo. Two ♂ and 3 ♀ examples received from Yokohama.

In some examples the transverse series of black spots is not present.

38. LEUCANIA RADIATA.

Leucania radiata, Brem. Lep. Ost-Sib. p. 48 (1864); Oberth. Etud. d'Ent. v. pl. iii. fig. 5 (1881).

Leucania abdominalis, Moore, Proc. Zool. Soc. 1881, p. 338.

Four examples, coll. Pryer.

Yokohama, Oiwake (*Pryer*); Amur, Askold, Dharmsala, and Khandalla.

39. LEUCANIA ZEÆ.

Leucania zeæ, Dup. Hist. Nat. Lép. Fr. vii. 1. p. 363, pl. 122. fig. 4; Guen. Noct. i. p. 77.

I took a specimen at Nemoro in August, and my native collector obtained one at Hakodate in June or July.

Nemoro (*Leech*); Hakodate (*Nat. Coll.*); Europe.

40. LEUCANIA IMPURA.

Noctua impura, Hübn. Noct. fig. 396.

Leucania impura, Treit. Schmett. v. 2. 294; Guen. Noct. i. p. 92.

One example, coll. Pryer.

Oiwake (*Pryer*); Europe.

41. LEUCANIA INNOCENS.

Nonargia innocens, Butl. Trans. Ent. Soc. 1881, p. 173.

Three specimens, coll. Pryer.

Yokohama (*Pryer*).

42. LEUCANIA CONIGERA.

Noctua conigera, Fabr. Mant. Ins. ii. 177; Hübn. Noct. fig. 222.

Noctua floccida, Esp. Schmett. iv. pl. 123. fig. 5.

Mythimna conigera, Treit. Schmett. v. 2. 190.

Leucania conigera, Boisd. Ind. Méth. 131. 1044; Guen. Noct. i. p. 72.

Three specimens, coll. Pryer.

I took one example at Nemoro in August.

Yokohama (*Pryer*); Nemoro (*Leech*); Europe.

43. NONAGRIA TURPIS.

Nonagria turpis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 359 (1879).

A fine series, coll. Pryer.

I took one ♀ example at Nagasaki in May.

Yokohama (*Pryer*); Nagasaki (*Leech*).

44. NONAGRIA SPARGANII.

Noctua sparganii, Esp. Schmett. pl. 148. figs. 2, 3; Hübn. Eur. Schmett. Noct. i. figs. 549, 550.

Nonagria sparganii, Treit. Schmett. Eur. ii. p. 323; Guen. Noct. i. p. 108.

One specimen, coll. Pryer.

Japan (*Pryer*); Europe.

45. NEPHELODES DATANIDIA.

Nephelodes datanidia, Butl. Cist. Ent. iii. p. 132 (1885).

Two examples, coll. Pryer (no. 711).

Yokohama? (*Pryer*).

46. HYDRÆCIA NICTITANS.

Noctua nictitans, Esp. Schmett. pl. 126. fig. 5; Borkh. Eur. Schmett. iv. 463.

Noctua chrysographa, Hübn. Noct. fig. 221.

Phalæna auricula, Donovan, Brit. Ins. xii. pl. 397. fig. 3.

Noctua auricula, Haw. Lep. Brit. p. 240.

Hydræcia nictitans, Guen. Noct. i. p. 126.

Var. *Noctua erythrostigma*, Haw. *l. c.*

Gortyna nictitans, var. *lucens*, Freyer, v. p. 143 (1845); Herr.-Schäff. Eur. Schmett. ii. p. 219, pl. 57. figs. 285–288.

A long and variable series, including specimens from Pryer's collection and others, taken by myself at Gensan in July and Hakodate in August. Sixteen of the twenty-eight specimens are of the *erythrostigma* form. Var. *lucens* is also represented.

Yokohama, Oiwake (*Pryer*); Gensan, Hakodate (*Leech*); Europe, N. America.

47. HYDRÆCIA PETASITIS.

Hydræcia petasitis, Doubl. Zool. v. p. 1915 (1847); Guen. Noct. i. p. 128.

Noctua vindelicia, Frey. Neu. Beitr. Schmett. vi. p. 82, pl. 531. fig. 3 (1849).

Hydræcia vindelicia, Herr.-Schäff. Eur. Schmett. 521–523; Guen. Noct. i. p. 127.

One example, coll. Pryer.

I took several specimens at Hakodate and Nemoro in August.

H. immanis, Guen., from New York, is probably referable to this species.

Yokohama (*Pryer*); Hakodate, Nemoro (*Leech*); Europe.

48. GORTYNA EDENTATA, sp. n. (Plate LI. fig. 9.)

♀. Primaries ochreous brown; inner line oblique, brown, bordered externally with paler; a darker transverse central shade followed by a pale-bordered red-brown line; submarginal line pale, undulating, preceded on the costa by a dark cloud; the stigmata are outlined with pale colour, but ill defined: secondaries pale ochreous, the inner half suffused with fuscous; central spot and curved transverse line fuscous; a thin brownish line at base of fringes. Under surface pale shining ochreous brown, all the wings traversed by a brown transverse line, fringes of primaries darker.

Expanse 38–42 millim.

One ♀ example, coll. Pryer, without exact locality.

I took a specimen at Oiwake in October 1886.

Allied to *G. emarginata*, Butl., but at once distinguished by its different colour and curvature of outer line of primaries. The outer margins are something similar in contour to those of *G. emarginata*, but they are not toothed.

Yokohama (*Pryer*); Oiwake (*Leech*).

49. OCHRIA OCHRACEA.

Noctua ochracea, Hübn. Beitr. i. pl. 2. M (1786).

Noctua flavago, Esp. Schmett. pl. 112. figs. 2–4 (1788); Hübn. Noct. figs. 186, 187.

Ochria flavago, Hübn. Verz. Schmett. 233. 2338.

Gortyna flavago, Treit. Schmett. v. 2. p. 335; Guen. Noct. i. p. 122.

Var. *Ochria fortis*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 83 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 9 (1878).

A few examples, coll. Pryer.

I took specimens at Hakodate in August and Oiwake in September.

Most of the Japanese specimens (*O. fortis*, Butl.) have the secondaries darker than typical *O. ochracea*, but they do not otherwise differ from European examples of this species in any important particular.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer* and *Leech*); Hakodate (*Leech*); Europe.

50. HELOTROPHA LEUCOSTIGMA.

Noctua leucostigma, Hübn. Noct. fig. 375.

Var. *Noctua fibrosa*, Hübn. Noct. fig. 385; (*Apamea*) Guen. Noct. i. p. 210.

Apamea leucostigma, Treit. Schmett. v. 2. p. 331; Guen. *l. c.*

Hydræcia leucostigma, Steph. Cat. Brit. Lep. p. 86.

Cerastis lævis, Butl. Trans. Ent. Soc. 1881, p. 181.

One unnamed example, coll. Pryer.

I took a long series at Gensan in June 1886, and my native collector obtained a few at Hakodate in June or July of the following year. Both forms of the species are well represented, and there are modifications of each; one of *leucostigma* form is the *Cerastis lævis*, Butl.

Yokohama (*Pryer*); Hakodate (*Nat. Coll.*); Gensan (*Leech*); Europe.

51. HELIOPHOBUS DISSECTUS.

Heliophobus dissectus, Walk. Cat. Lep. Het. Suppl. ii. p. 656 (1865).

Neuria dissecta, Moore, Lep. Ceylon, iii. p. 22, pl. 146. fig. 7 (1884).

I took one example of this species at Nikko in September.

Nikko (*Leech*); Ceylon, Bengal.

52. AXYLIA PUTRIS.

Phal.-Noctua putris, Linn. Faun. Suec. p. 315.

Noctua putris, Esp. Schmett. iv. pl. 138. figs. 4, 5.

Noctua lignosa, Hübn. Noct. fig. 245.

Xylina putris, Treit. Schmett. Eur. v. 3. p. 29.

Axylia putris, Guen. Noct. i. p. 134.

Two specimens, coll. Pryer.

My native collector took examples of this species at Hakodate in June or July.

Tokio, Hakodate, Foochau; Europe.

53. MAMESTRA CUNEATA, sp. n. (Plate L. fig. 12.)

♂. Primaries dark brown with a reddish-violet tinge more pronounced towards the outer margin; basal line abbreviated, wavy; the much-indented inner and elbowed and angulated outer transverse lines approximate before reaching the inner margin; submarginal line pale, edged internally with darker and preceded by two cuneiform black dashes, the larger opposite the lower end and the smaller opposite the upper end of reniform; this last, together with the orbicular, are slightly paler than ground-colour; a series of dark contiguous lunules on outer margin: secondaries fuscous brown, paler towards base and inner margin, central transverse line paler. Under surface pale fuscous brown; central spot and transverse line on all the wings blackish, the latter followed by a broad fuscous band.

Expanse 38 millim.

One ♂ example, coll. Pryer, without exact locality.

Yokohama? (*Pryer*).

54. MAMESTRA ADVENA.

Mamestra advena, Fabr., var. *adjuncta*, Staud. Stett. ent. Zeit. 1888.

Five specimens, coll. Pryer.

A specimen in National Collection, labelled *Alysia grisea*, Butl., from Japan, is probably referable to this species, but the example is in such poor condition that it is not possible to come to any satisfactory conclusion on this point.

Oiwake, Yokohama? (*Pryer*); Chang Yang (*Pratt*); Amurland.

55. MAMESTRA BRASSICÆ.

Phal.-Noctua brassicæ, Linn. Syst. Nat. x. p. 516.

Noctua brassicæ, Esp. iv. pl. 159. figs. 1–6; Hübn. Noct. fig. 88.
Mamestra brassicæ, Treit. Schmett. v. 2. 150; Guen. Noct. i. p. 198.

This species appears to be generally distributed throughout Japan, occurring from August to October.

Japan; West Canada; Europe.

56. MAMESTRA ALIENA.

Noctua aliena, Hübn. fig. 441.
Hadena aliena, Guen. ii. p. 100.

One specimen, coll. Pryer.

Oiwake (*Pryer*); Europe.

57. MAMESTRA PERSICARIÆ.

Phal.-Noctua persicariæ, Linn. Faun. Suec. 319.
Noctua persicariæ, Esp. Schmett. iv. pl. 129. figs. 1–3; Hübn. Noct. fig. 64.
Mamestra persicariæ, Treit. Schmett. v. 2. 156; Guen. Noct. i. p. 199.
Mamestra persicariæ, var. *unicolor*, Staud. Cat. p. 91.

Two examples, coll. Pryer, one of which has the reniform stigma filled up with the black ground-colour. This is var. *unicolor*.

Oiwake (*Pryer*); Europe.

58. XYLOPHASIA INCOGNITA.

Xylophasia incognita, Butl. Cist. Ent. iii. p. 132 (1885).

The type specimen in National Collection at South Kensington is so poor in condition that it is not possible to say what it may have been, but Mr. Butler compares his *X. incognita* with *X. lithoxylea* and adds, "In coloration this species corresponds more nearly with the Chilian *X. cauquenensis* than with *X. lithoxylea*, but in pattern it scarcely differs from the latter."

Yesso (*Pryer*).

59. XYLOPHASIA SCOLOPACINA.

Noctua scolopacina, Esp. Schmett. iv. pl. 130. fig. 1; Hübn. Noct. fig. 460.
Xylina scolopacina, Treit. Schmett. v. 3. 33.
Xylophasia scolopacina, Dup. vii. 113. 3; Steph. Ill. Brit. Ent., Haust. ii. p. 178; Guen. Noct. i. p. 145.

A few examples, coll. Pryer.

My native collector took specimens at Hakodate in June and July.

Oiwake (*Pryer*); Hakodate (*Nat. Coll.*); Europe.

60. XYLOPHASIA FUNEREA.

Hadena funerea, Hein. Schmett. Deutschl. i. 828 (1859).
Xylophasia sodalis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 83 (1878); Ill. Typ. Lep. Het. pl. xxix. fig. 2 (1878).

A fine series, coll. Pryer.

I have no example of *H. funerea* from Europe; but Dr. Staudinger has identified as that species my Japanese specimens, which are identical with *X. sodalis*, Butl. There are two forms of this species, one of which resembles typical *X. rurea* from Europe, but is without any pale markings on inner margin; the other is the *funerea* of Hein., and is analogous to the var. *alopecurus*, Esp. (=*combusta*, Dup.), of *X. rurea*.

Oiwake (*Pryer*); Yokohama (*Jonas* and *Pryer*); Tokio, Kiukiang.

61. XYLOPHASIA COMMIXTA.

Xylophasia commixta, Butl. Trans. Ent. Soc. 1886, p. 174.

Several specimens, coll. Pryer.

One of the two specimens under the name of *X. flavostigma* in the National Collection is from Yokohama and appears referable to the *X. commixta* of Butler.

Tokio (*Fenton*); Yokohama (*Jonas*).

62. XYLOPHASIA SCITULA.

Xylophasia scitula, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 359 (1879).

Two examples, coll. Pryer.

Yokohama (*Pryer*).

63. XYLOPHASIA TYCHOONA, sp. n. (Plate LI. fig. 3.)

♂. Primaries purplish brown, mottled with pale ochreous brown on the base and along costa; the black indented inner and elbowed wavy outer line approximate above inner margin, and are united by a black longitudinal bar; submarginal line pale, angulated below costa and again at middle; reniform and orbicular stigmata pale brown, faintly outlined in darker, the former followed by a large pale ochreous-brown patch; there are three pale ochreous-brown dots on costa between outer and submarginal lines: secondaries pale brown suffused with darker; fringes grey-brown, tipped with whitish and preceded by a dark brown line. Under surface fuscous brown, central area and outer margin paler, central line dark but not well defined: secondaries pale brown, central spot and line darker, a broad antemarginal fuscous band interrupted near anal angle.

Expanse 31 millim.

One, coll. Pryer, without locality.

64. DIPTERYGIA PINASTRI.

Phal.-Noctua scabriuscula, Linn. Syst. Nat. x. p. 516 (1758); Clerck, Icon. pl. 1. fig. 8.

Phal.-Noctua pinastri, Linn. Faun. Suec. p. 315.

Noctua pinastri, Hübn. Noct. fig. 246.

Xylina pinastri, Treit. Schmett. v. 3. 58.

Dipterygia pinastri, Steph. Ill. Brit. Ent., Haust. ii. p. 168; Guen. Noct. i. p. 146.

Hadena caliginosa, Walk. Cat. Lep. Het. xv. p. 1729.

A few specimens, coll. Pryer.

My native collector obtained examples of this species at Hakodate in June and July. Japanese specimens are darker than European.
Yokohama, Oiwake (*Pryer*); Yokohama (*Nat. Coll.*); N. China.

65. DIPTERYGIA JAPONICA, sp. n. (Plate L. fig. 9.)

Closely allied to *D. scabriuscula*, but the stigmata and transverse lines are hardly traceable, and the "bird's-wing" mark is white and different in form. The dark line which outlines the white wing-like mark in this species rises vertically from near the middle of inner margin, and then curving sharply outwards continues an undulating course to the middle of outer margin. The fringes are dark, streaked with white from apex to middle, and white chequered with brownish to inner angle. Secondaries grey-brown tinged with fuscous. Under surface of primaries fuscous brown, with a pale shining discal spot and some white scales in the fringes towards inner angle; secondaries shining grey-brown, with a dark central spot. Thorax and abdomen slender.
One ♂ example, coll. Pryer (no. 714).

66. APAMEA GEMINA.

Noctua gemina, Hübn. Noct. fig. 482.
Hadena gemina, Treit. Schmett. v. 1. 345.
Apamea gemina, Guen. Noct. i. p. 208.
Noctua anceps, Dup. Hist. Nat. Lép. Fr. vii. pl. 107. fig. 5.
Var. *Noctua remissa*, Treit. Schmett. v. 1. p. 346.
Noctua submissa, Treit. *l. c.*
Five specimens, coll. Pryer (no. 725, *Xylophasia*?, sp.).
Yokohama (*Pryer*); Europe.

67. APAMEA BASILINEA.

Noctua basilinea, Fabr. Mant. Ins. ii. 183; Esp. Schmett. iv. pl. 166. fig. 1; Hübn. Noct. fig. 427.
Apamea basilinea, Treit. Schmett. v. 2. 110; Guen. Noct. i. p. 206.
Four specimens, coll. Pryer.
In Japanese specimens of this species the space between transverse and central lines on primaries is darker than the rest of the wing, and in this respect they are like some examples I have from Germany.
Yokohama (*Pryer*).

68. APAMEA CONCILIATA.

Apamea conciliata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 84 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 3 (1878).
Several specimens, coll. Pryer.
Yokohama (*Jonas* and *Pryer*).

69. APAMEA REPETITA.

Apamea repetita, Butl. Cist. Ent. iii. p. 133 (1885).
A few specimens, coll. Pryer.
Yokohama (*Jonas* and *Pryer*).

70. APAMEA ASKOLDIS.

Hadena (*Apamea*) *askoldis*, Oberth. Etud. d'Ent. v. p. 72, pl. iii. fig. 13 (1880).

Apamea nivalis, Butl. Trans. Ent. Soc. 1881, p. 177.

One example, coll. Pryer.

In *A. askoldis*, Oberth., the ground-colour is greyish and the patch from costa a brighter brown than the same character in *A. nivalis*, Butl. At the same time the disposition of the lines and other markings is identical in both insects; therefore I have considered them forms of one species. I should remark that the markings are similar in character to those of *Ophiogramma* from Europe.

Tokio (*Fenton*); Yokohama? (*Pryer*); Askold.

71. APAMEA LIMBATA.

Apamea limbata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 360 (1879).

Five specimens, coll. Pryer.

Yokohama (*Pryer*).

72. POLYDESMA VULGARIS.

Polydesma vulgaris, Butl. Trans. Ent. Soc. 1886, p. 135.

Six specimens, coll. Pryer.

Yokohama (*Pryer*); Tokio (*Maries*); Chekiang (*W. B. Pryer*).

73. GLOTTULA SQUALIDA, sp. n. (Plate LII. fig. 3.)

Primaries shining blackish brown, traversed by two black lines, the first, commencing in a patch on costa, is oblique and angulated at the middle, the second is curved and denticulate; stigmata black: secondaries dark brown. Under surface dark brown, silky; central spot and line on each wing, but the latter is not very distinct.

Expanse, ♂ 36 millim., ♀ 31 millim.

Three examples, coll. Pryer.

Oiwake (*Pryer*).

74. GLOTTULA SORDIDA.

Glottula sordida, Butl. Trans. Ent. Soc. 1881, p. 174.

Gerbatha pseudodyops, Butl. Ann. & Mag. Nat. Hist. (5) xiii. p. 274 (1884).

A long and most variable series, coll. Pryer.

I took this species at Hakodate in August 1886, and my native collector at Gensan in August 1887.

Yokohama, Yesso (*Pryer*).

75. SPÆLOTIS NITENS.

Spælotis nitens, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 164 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 8 (1878).

Nænia muscosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 290 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 9 (1879).

Several specimens, coll. Pryer.

I took examples at Gensan in July, and my native collector at Hakodate in the same month. I have also received it from Nikko.

Yokohama (*Jonas* and *Pryer*); Hakodate, Nikko (*Nat. Coll.*); Gensan (*Leech*).

76. RAPHIA FASCIATA.

Raphia fasciata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 193 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 5 (1878).

? *Hadena parietum*, Oberth. Etud. d'Ent. v. pl. iii. fig. 15 (1881)

A few specimens, coll. Pryer.

I took examples of this species at Gensan in June and July, and my native collector obtained it there in August.

Yokohama (*Jonas*); Oiwake (*Pryer*); Gensan (*Leech*).

77. MIANA SEGREGATA.

Miana segregata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 85 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 5 (1878).

Several specimens, coll. Pryer.

Mr. Andrews obtained specimens at Hakodate, and I took a few at Gensan in July.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Hakodate (*Andrews*); Gensan (*Leech*); Tokio, Shanghai.

78. MIANA VULNERATA.

Miana vulnerata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 84 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 4 (1878).

A nice series, coll. Pryer.

I took this species at Gensan in June, and Fushiki in July.

Yokohama (*Jonas* and *Pryer*); Fushiki, Gensan (*Leech*).

79. MIANA SUBFASCIATA.

Gerbatha subfasciata, Butl. Trans. Ent. Soc. 1881, p. 193.

Several specimens, coll. Pryer.

I took a few examples at Hakodate in August 1886, and my native collector obtained several specimens there in July 1887.

Tokio (*Fenton*); Yokohama, Oiwake (*Pryer*); Hakodate (*Leech*).

80. MIANA FALSA.

Miana falsa, Butl. Cist. Ent. iii. p. 132 (1885).

Two examples, coll. Pryer.

Yokohama ? (*Pryer*).

81. MAMESTRA BIGUTTATA.

Mamestra biguttata, Motsch. Bull. Soc. Nat. Mosc. xxxix. i. p. 194 (1866).

I took specimens at Nagasaki in June, Fushiki and Tsurugain July, and my native collector obtained the species at Gensan in August.

Tokio (*Fenton*); Fushiki, Nagasaki, Tsuruga, Gensan (*Leech*; *Nat. Coll.*).

82. PERIGEA ARGYROSTICTA.

Perigea ? argyrosticta, Butl. Trans. Ent. Soc. 1881, p. 177.

Tokio (*Fenton*).

83. PERIGEA GALAXIA.

Perigea galaxia, Butl. Proc. Zool. Soc. 1883, p. 159.

One example, coll. Pryer.

Japan (*Pryer*); Dharmsala?

84. PERIGEA GEMELLA, sp. n. (Plate LIII. fig. 12.)

Primaries dark rusty brown with stramineous markings; first transverse line, represented by a costal spot and some scattered dots across the wing, immediately precedes the well-defined orbicular stigma; the conspicuous reniform spot is preceded by two irregular-shaped dashes on costa, and followed by a transverse series of closely contiguous oblong spots, interrupted by a thin transverse line of the ground-colour; beyond is another irregular-shaped blotch on the costa, and a short dash before apex; fringes dark: secondaries grey-brown, with a darker central transverse line edged externally with paler; fringes sprinkled with fuscous. Under surface of primaries fuscous radiated with paler; all the wings have a dark central transverse line edged externally with paler; secondaries whitish grey, clouded along costa and on outer margin with fuscous.

Expanse 26 millim.

Five specimens, including both sexes, taken by my native collector at Gensan in August and September. I have also received three examples from Mr. Manley of Yokohama.

In two Gensan specimens the upper spots of the central series are confluent and connected with reniform stigma.

85. PERIGEA CENTRALIS.

Perigea centralis, Walk. Cat. Lep. Het. xi. p. 734 (1857).

Celæna serva, Walk. *l. c.* xv. p. 1689 (1858).

Perigea serva, Butl. Proc. Zool. Soc. 1883, p. 159.

♀. *Perigea illecta*, Walk. *l. c.* xxxii. p. 684 (1865).

The female specimen of this species, to which Walker gave the name of *illecta*, was from Japan, and Butler considers that this insect is referable to *P. dolorosa*, Walk.

Japan; N. India; Ceylon; Andaman Islands.

86. ILATTIA CEPHUSALIS.

Ilattia cephusalis, Walk. Cat. Lep. Het. xvi. p. 209 (1858).

Amyna cephusalis, Butl. Proc. Zool. Soc. 1881, p. 617.

Miana inornata, Walk. Cat. Lep. Het. Suppl. ii. p. 677 (1865).

Perigea leucospila, Walk. *l. c.* p. 683.

I took specimens at Gensan in July 1886, and my native collector obtained a long and variable series there in August 1887.

Gensan (*Leech*); India, China.

87. Ilattia stellata.

Amyna stellata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 6.
Mesotrosta stigmatula, Snell. Tijds. v. Ent. xxiii. p. 55.

A nice series, coll. Pryer.

I took one example at Nagasaki in May, and one was obtained at Hakone in August.

Yokohama (*Jonas* and *Pryer*); Hakone, Nagasaki (*Leech*); Tokio.

88. Ilattia apicalis.

Ilattia apicalis, Moore, Descr. Ind. Lep. Atk. ii. p. 112 (1882).

One example taken by my native collector at Gensan, August 1887.

Gensan (*Nat. Coll.*); Sikkim.

89. Caradrina morpheus.

Phal.-Noctua morpheus, Hufn. Berl. Mag. iii. p. 302.
Noctua sepii, Hübn. Noct. pl. 34. fig. 161.
Caradrina morpheus, Treit. Schmett. v. 2. 249.

I took one specimen at Gensan in June.

Gensan (*Leech*); Europe, Ural.

90. Caradrina lenta.

Caradrina lenta, Treit. Schmett. v. 2. 257; Guen. Noct. i. p. 243.

A series, coll. Pryer.

Japan (*Pryer*); Europe, Altai.

91. Dadica palpalis.

Radinavia palpalis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 161 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 7 (1878).
Dadica lineosa, Moore, Proc. Zool. Soc. 1881, p. 349.
Caradrina albosignata, Oberth. Etud. d'Ent. v. p. 73, pl. iv. fig. 1 (1880).
Caradrina albosignata, var. *cæca*, Oberth. *l. c.*

I took this species in Satsuma in May, and at Nagahama and Gensan in July. My native collector took specimens at Hakodate in June and July.

A very variable species; my series from Japan and Corea embraces examples agreeing with all the named forms.

Yokohama (*Jonas*); Satsuma, Nagahama, Gensan (*Leech*); Hakodate (*Nat. Coll.*); Askold, Punjaub.

92. Laphygma exigua.

Noctua exigua, Hübn. Noct. fig. 362.
Caradrina exigua, Treit. Schmett. v. 2. 254.
Laphygma exigua, Guen. Noct. i. p. 158.

One specimen, coll. Pryer.

Japan (*Pryer*); Europe.

93. SCEDOPLA REGALIS.

Scedopla regalis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 201 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 5 (1879).

Four specimens, received from Mr. Manley of Yokohama.

Yokohama (*Jonas* and *Manley*); Tokio.

94. CLOANTHA POLYODON.

Phalæna polyodon, Clerck, Icones, pl. ii. fig. 3 (1759).

Phal.-Noctua perspicillaris, Linn. Faun. Suec. p. 317 (1761).

Noctua perspicillaris, Esp. Schmett. iv. pl. 134. fig. 3; Hübn. Noct. fig. 249.

Xylina perspicillaris, Treit. Schmett. v. 3. 69.

Cloantha perspicillaris, Guen. Noct. ii. p. 113.

Cloantha intermedia, Brem. Lep. Ost-Sib. p. 53, pl. v. fig. 13 (1864).

Auchmis sikkimensis, Moore, Proc. Zool. Soc. 1867, p. 49, pl. 6. fig. 15.

A long series, coll. Pryer.

I took examples of this species in Satsuma in May, at Tsuruga, Fushiki, and Gensan in July, Hakodate in August, and my native collector took some at Ningpo in June.

Yokohama (*Pryer*); Satsuma, Tsuruga, Fushiki, Gensan (*Leech*); Kiukiang (*Pratt*); Ningpo, Darjeeling, Amur, Europe.

95. OCHROPLEURA STUPENDA.

Ochropleura stupenda, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 166 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 3 (1878).

Noctua stupens, Oberth. Etud. d'Ent. v. p. 75, pl. vii. fig. 7 (1880).

Several fine examples, coll. Pryer.

Varies in colour; some of the specimens agree well with figure of *N. stupens*, Oberth.

Yokohama (*Jonas* and *Manley*); Yoshino, Oiwake (*Pryer*); Gensan (*Nat. Coll.*).

96. OCHROPLEURA TRIANGULARIS.

Ochropleura triangularis, Moore, Proc. Zool. Soc. 1867, p. 56.

Six specimens, coll. Pryer.

I have received two examples from Mr. Manley of Yokohama.

This species is only separable from *O. musiva*, Hübn., by the dark secondaries. Dr. Staudinger considers *O. triangularis* to be very near *stentzi*, Led.

97. OCHROPLEURA PLECTA.

Phal.-Noctua plecta, Linn. Faun. Suec. p. 321.

Noctua plecta, Esp. Schmett. iv. pl. 143. figs. 4, 5; Hübn. Noct. fig. 117; Treit. Schmett. v. p. 248; Guen. Noct. i. p. 326.

Ochropleura plecta, Hübn. Verz. Schmett. 223. 2233; Walk. Cat. Lep. Het. x. p. 406.

A male example, coll. Pryer.

I took two specimens at Gensan in July.
Yokohama (*Pryer*); Gensan (*Leech*); Europe, N. America.

98. NOCTUA TARDA, sp. n. (Plate L. fig. 4.)

♀. Primaries purplish brown; a double black basal line, enclosing a paler space, extends only to the submedian nerve, this is followed by a small quadrate black spot on the costa; double inner line black, wavy, and enclosing a pale space, the lower portion clouded internally with blackish; outer line black, also double and enclosing a pale space; before the indistinct pale submarginal line is a blackish streak on the costa, clouded internally with blackish; reniform and orbicular outlined in pale ochreous-brown, with pinkish-brown centres bordered with dark brown, the interspace occupied by a blackish quadrate spot: secondaries grey-brown, darker towards the margins, central spot dark grey-brown. Under surface fuscous grey; primaries streaked with purplish brown on the costa and brassy reflections on inner margins; secondaries pinkish brown, paler towards abdominal margin; a broad black central line on all the wings, and a central spot on secondaries.

Expanse 40 millim.

One example taken by myself at Hakodate, August 1886.

99. NOCTUA BAJA.

Noctua baja, Fabr. Mant. Ins. ii. p. 175.

Teniocampa tabida, Butl. Ann. & Mag Nat. Hist. (5) i. p. 166 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 5.

The specimen in the National Museum under the name of *T. tabida*, Butl., is most certainly a form of *Noctua baja*.

Yokohama (*Jonas*).

100. NOCTUA AUGUR.

Noctua augur, Fabr. Sp. Ins. ii. p. 223; Hübn. Noct. p. 148.

Graphiphora augur, Steph. Ill. ii. p. 131; Walk. Cat. Lep. Het. ii. p. 387.

I took a specimen of each sex at Oiwake in October.

Oiwake (*Leech*); Europe; N. America.

101. NOCTUA DILATATA.

Mesogona dilatata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 364 (1879).

Several specimens, coll. Pryer.

I have received one rather dark specimen from Mr. Manley. This species is closely allied to *N. umbrosa* from Europe.

Yokohama (*Pryer* and *Manley*).

102. GRAPHIPHORA LEPIDA.

Graphiphora lepida, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 362 (1879).

Six specimens, coll. Pryer.

Yokohama? (*Pryer*).

103. GRAPHIPHORA C-NIGRUM.

Phal.-Noctua c-nigrum, Linn. Syst. Nat. x. p. 516; Faun. Suec. 36; Clerck, Icones, pl. i. fig. 3.

Noctua gothica, var. *singularis*, Esp. Schmett. iii. pl. 76. fig. 3.

Noctua c-nigrum, Hübn. Noct. fig. 111; Treit. Schmett. v. 237; Guen. Noct. i. p. 328.

Megasema c-nigrum, Hübn. Verz. Schmett. 223. 2231.

Graphiphora c-nigrum, Steph. Ill. Brit. Ent., Haust. iii. p. 136.

This is No. 782 of Pryer's Catalogue, and there were several specimens in his collection.

Yokohama, Oiwake (*Pryer*); Gensan (*Nat. Coll.*); Europe; N. America.

104. GRAPHIPHORA TRIANGULUM.

Noctua triangulum, Hufn. Berl. Mag. iii. p. 306; Treit. Schmett. v. 1. 240; Guen. Noct. i. p. 329.

Noctua sigma, Knoch, Beitr. Ins. iii. pl. 4. fig. 7; Esp. Schmett. iv. pl. 186. figs. 1–4.

Megasema triangulum, Hübn. Verz. Schmett. 222. 2227.

Graphiphora triangulum, Steph. Ill. Brit. Ent., Haust. ii. p. 133.

Var. *Ochropleura plumbata*, Butl. Trans. Ent. Soc. 1881, p. 180.

One ♀ specimen, coll. Pryer.

It is certainly larger, but in all other respects *O. plumbata*, Butl., agrees exactly with some Gensan specimens of *O. triangulum* in my collection.

Yokohama, Yoshino (*Pryer*); Tokio (*Fenton*).

105. GRAPHIPHORA DITRAPEZIUM.

Noctua ditrapezium, Bork. Schmett. iv. p. 515 (1792); Hübn. Noct. fig. 472; Treit. Schmett. Suppl. x. p. 36; Guen. Noct. i. p. 329.

Noctua tristigma, Treit. Schmett. v. 1. 243.

Graphiphora ditrapezium, Steph. Cat. Brit. Lep. p. 71.

My native collector took an example at Hakodate in June or July.

Hakodate (*Nat. Coll.*); Europe.

106. GRAPHIPHORA LUBENTIA.

Graphiphora lubentia, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 362 (1879).

Eight examples, coll. Pryer, and one taken by myself at Hakodate in August.

Probably a form of *G. ditrapezium*.

Tokio (*Fenton*); Yokohama, Oiwake (*Pryer*); Hakodate (*Leech*).

107. GRAPHIPHORA EXUSTA.

Graphiphora exusta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 164 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 11 (1878).

Several specimens, coll. Pryer.

My native collector took this species at Hakodate in July, and I have a male example taken by Mr. Eastlake at Hakone.

A very variable species. Two specimens have the basal two thirds of primaries yellowish grey; others have a triangular or quadrate black spot before the orbicular and a square black patch between the stigmata. Both forms are connected by intermediates with the type form.

Yokohama (*Jonas* and *Pryer*); Hakone (*Eastlake*); Hakodate (*Nat. Coll.*); Askold; Amur.

108. GRAPHIPHORA BRUNNEA.

Noctua brunnea, Fabr. Mant. 168; Hübn. Noct. fig. 121; Treit. Schmett. vi. p. 219; Guen. Noct. i. 330.

Graphiphora brunnea, Steph. Ill. Haust. ii. p. 131.

One example without locality in Pryer's collection with *G. exusta*.

Although not quite identical with any specimen in my European series of *G. brunnea* there is no doubt that this example is referable to that species. As, however, it runs very close to some of the forms of *G. exusta* the probability of this last not being specifically distinct from *G. brunnea* is suggested.

Japan (*Pryer*); Europe; Ural; Altai.

109. GRAPHIPHORA DAHLII.

Noctua dahlii, Hübn. Noct. figs. 465, 466; Treit. Schmett. v. 1. 222; Guen. Noct. i. p. 332.

Graphiphora dahlii, Steph. Ill. Brit. Ent., Haust. ii. p. 134.

Var. *Graphiphora canescens*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 165 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 1 (1878).

Several specimens, coll. Pryer.

I took this species at Oiwake in October.

Very variable in size, colour, and definition of markings. Some of the specimens in my Japanese series agree with *G. canescens*, Butl., others are quite typical, and others again connect these two forms. There are also examples which come very close to *G. brunnea*, and I may remark that two similar specimens, also from Japan, are incorporated with *G. brunnea* in the National Collection, whilst two other Japanese specimens in the series of *G. subdolens*, Butl., in the same collection are simply *G. dahlii* and do not agree with the Dharmsala specimens in same series.

Tokio (*Fenton*); Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer* and *Leech*).

110. GRAPHIPHORA DESCRIPTA.

Noctua descripta, Brem. Bull. Acad. Sci. Pétersb. iii. p. 576; Lep. Ost-Sib. pl. iv. fig. 11.

Graphiphora rubicilia, Moore, P. Z. S. 1867, p. 55.

A nice series, coll. Pryer.

I took specimens at Hakodate in August, Nikko in September, and Oiwake in October.

Yokohama (*Pryer*); Oiwake, Nikko, Hakodate (*Leech*); Darjeeling; Amur.

111. GRAPHIPHORA ILLOBA.

Agrotis illoba, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 7 (1879).

Graphiphora pacifica, Butl. A. M. N. H. (5) i. p. 165 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 2 (1878).

An extensive and variable series, coll. Pryer.

I took this species at Yokohama in October.

The difference between *G. illoba* and *G. pacifica*, Butl., is one of colour only.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Kiukiang (*Pratt*).

112. GRAPHIPHORA DEPARCA.

Mythimna deparca, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 35 (1879).

Several specimens, coll. Pryer.

I took two males at Oiwake in October.

Except that the ♂ of this species has pectinated antennæ it hardly separable from *G. festiva*. Mr. Butler says it is allied *Mythimna placida*, but in this I cannot concur.

Yokohama (*Pryer*); Oiwake (*Leech*).

113. CHERSOTIS QUADRISIGNA.

Agrotis quadrisigna, Moore, Proc. Zool. Soc. 1881. p. 350.

Chersotis quadrisigna, Butl. Proc. Zool. Soc. 1881, p. 617.

I received one specimen from Mr. Manley of Yokohama.

Yokohama (*Manley*); N. India.

114. HERMONASSA CECILIA.

Hermonassa cecilia, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 164 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 9 (1879).

Opigena arenosa, Butl. Trans. Ent. Soc. 1881, p. 179.

Several specimens, coll. Pryer, among which are examples varying in the direction of *O. arenosa*, Butl., which is certainly a pale form of *O. cecilia*. I took a specimen at Nikko in September 1886 which agrees exactly with the type of *O. arenosa* in the National Collection at South Kensington.

Yokohama (*Jonas* and *Pryer*); Tokio (*Fenton*); Yesso (*Pryer*); Hakodate, Nikko (*Leech*); Kiukiang (*Pratt*).

115. HAPALIA PRÆCOX.

Phal.-Noctua præcox, Linn. Syst. Nat. x. 517, xii. 854.

Noctua præcox, Esp. Schmett. iv. pl. 89. figs. 4–7.

Noctua præceps, Hübn. Noct. pl. 15. fig. 70.

Hapalia præcox, Hübn. Verz. Schmett. 220. 2204; Walk. Cat. Lep. Het. x. p. 358.

Agrotis præcox, Treit. Schmett. v. 2. 60; Guen. Noct. i. p. 296.

Eight specimens, coll. Pryer, showing the usual variation in colour.

Oiwake, Yokohama, Yesso (*Pryer*); Europe.

116. AGROTIS DEPRAVATA.

Agrotis depravata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 360 (1879).

A fine series, coll. Pryer.

I took a ♀ specimen at Nagasaki in May, and a ♂ at Gensan in July 1886.

My native collector obtained a ♂ example at Gensan in August 1887.

Tokio (*Fenton*); Yokohama (*Pryer*); Gensan, Nagasaki (*Leech*).

117. AGROTIS TOKIONIS.

Agrotis tokionis, Butl. Trans. Ent. Soc. 1881, p. 178.

Agrotis fucosa, Butl. l. c. p. 179.

I took two examples at Oiwake in October.

This species is larger than *A. corticea*, but is certainly more nearly related to it than to *A. saucia*, *A. suffusa*, or *A. segetum*. Mr. Pryer appears to have confounded *A. tokionis* with *A. segetum*, var. *ingrata*, Butl., as there was a fine series of specimens in his collection under the latter name.

Tokio (*Fenton*); Yokohama (*Pryer* and *Manley*); Oiwake, Yahyuskiro (*Pryer*).

118. AGROTIS SUFFUSA.

Noctua suffusa, Hübn. Noct. fig. 134.

Agrotis suffusa, Treit. Schmett. v. 1. 152; Guen. Noct. i. p. 268.

I took specimens of this species at Gensan only, but there was a fine series in Mr. Pryer's collection. Some variation is exhibited, though not to the same extent as is often seen in a good series of *A. suffusa* from Europe.

Yokohama (*Pryer*); Gensan (*Leech*); Tokio, Kiukiang (*Pratt*); Australia, Africa, Europe.

119. AGROTIS SEGETUM.

Noctua segetum, Schifferm. Wien. Verz. p. 81, pl. i. figs. 3, *a*, *b*; Hübn. Noct. fig. 147.

Noctua segetis, Hübn. Noct. fig. 146.

Noctua fucosa, Esp. Schmett. iii. pl. 64. fig. 4.

Agrotis segetum, Treit. Schmett. v. 1. 155; Guen. Noct. i. p. 274.

Agrotis aversa, Walk. Cat. Lep. Het. ii. p. 345.

Agrotis ingrata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 9 (1878).

Several specimens, coll. Pryer.

I took this species at Nagasaki in May, Sakata in August, Nikko in September, and Oiwake in October, and Mr. Smith at Hakone in August.

Yokohama (*Pryer* and *Manley*); Gifu (*Pryer*); Oiwake, Nikko, Nagasaki, Sakata (*Leech*); Hakone (*Smith*); India, Europe.

120. AGROTIS INFORMIS, sp. n. (Plate L. fig. 1.)

♂. Primaries pale violet-grey suffused with brownish, basal third tinged with tawny; abbreviated basal line dark edged externally with whitish, inner line pale edged externally with darker; outer line dark, serrated, curved, edged with paler; orbicular outlined and more or less filled up with black; reniform large, black, and clearly defined; claviform black, well developed: secondaries pearly, with a black lunule and narrow marginal border. Under surface of primaries fuliginous with a darker central transverse line; secondaries pearly white, fuscous on costa, central line indicated by some black oblong dots on nervures.

♀. In this sex the orbicular is more elongated and the secondaries are suffused with fuscous on the outer margin.

Var. CONFLUENS.

The reniform and orbicular united, forming a large, somewhat triangular, blotch.

Expanse 44 millim.

Six specimens, coll. Pryer.

My native collector obtained four examples at Hakodate in June or July.

Allied to *A. exclamationis*.

Yokohama?, Yesso (*Pryer*); Hakodate (*Nat. Coll.*).

121. AGROTIS OBSCURA.

Noctua obscura, Brahm, Insektenkal. i. p. 191 (1790).

Noctua bigramma, Esp. Schmett. iv. pl. 150. fig. 2.

Noctua ravida, Hübn. Noct. fig. 126 (post 1800).

Agrotis ravida, Treit. Schmett. v. 1. 207; Guen. Noct. i. p. 30[illegible]0.

Graphiphora crassa, Steph. Ill. Brit. Ent., Haust. ii. p. 1[illegible]30 (1827).

Graphiphora valida, Walk. Cat. Lep. Het. Suppl. iii. p. 7[illegible]1 (1865).

Graphiphora caliginea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 165 (1878).

Several specimens, coll. Pryer.

I took examples of this species at Gensan in July and at Oiwake in October. My native collector secured a long and variable series at Hakodate in July. Several specimens agree with Walker's *G. valida* and *G. caliginea*, Butl. Others are exactly identical with the typical European *A. ravida*, whilst others again are not quite like

either, and might be considered distinct only that there are still other forms which connect them with *A. ravida* and *A. valida*, and these last are also connected by intermediates.

Yokohama (*Pryer*); Hakodate (*Nat. Coll.*); Oiwake, Gensan (*Leech*); Shanghai, Tokio, Chiuzenji. Europe; N. America.

122. AGROTIS BREMERI.

Agrotis bremeri, Ersch. Horæ Soc. Ent. Ross. (Russian ed.) iv. p. 152 (1870).

Agrotis speciosa, Brem. Lep. Ost-Sib. p. 50, pl. iv. fig. 10.

One specimen, coll. Pryer.

Yesso (*Pryer*); Amur.

123. AGROTIS LUCENS.

Spælotis lucens, Butl. Trans. Ent. Soc. 1881, p. 179.

I have no example of this species, but examination of the type specimen in Nat. Collection leads me to suppose that it is a near relation of *Agrotis senna*, and is altogether out of place in the genus *Spælotis*.

Tokio (*Fenton*).

124. AGROTIS SQUALIDA.

Spælotis squalida, Boisd. Ind. Méth. 107. 800.

Agrotis lycarum, Herr.-Schäff. Schmett. ii. pl. 22. figs. 122–124 (1846).

Agrotis squalida, Guen. Noct. i. 300 (1852).

Three examples, coll. Pryer.

I took one specimen at Hakodate in August.

Hakodate (*Leech*); Yokohama? (*Pryer*); Ural, Amur, Altai.

125. AGROTIS UNDOSA, sp. n. (Plate L. fig. 3.)

Primaries violet-grey, traversed by a number of faint wavy lines; central third darker, inclining to black towards costa and limited by slightly indented inner and undulated outer lines; the inner portion of basal third is crossed by several rather darker lines; the dark submarginal line commences in a black quadrate spot on costa; stigmata indistinctly outlined; fringes preceded by a blackish line: secondaries blackish, paler towards base, central lunule blackish; fringes yellowish. Under surface fuscous, central and submarginal line of primaries darker, central area of secondaries with a black spot and transverse line. Head and thorax silvery grey, collar blackish.

Expanse 38 millim.

One ♀ specimen, coll. Pryer.

I took a ♂ example at Nikko in September, and another at Oiwake in October 1886.

Yokohama? (*Pryer*); Nikko, Oiwake (*Leech*).

126. POLYPHÆNIS PULCHERRIMA.

Epilecta pulcherrima, Moore, Proc. Zool. Soc. 1867, p. 54, pl. vi. fig. 3.

Polyphænis pulcherrima, Oberth. Etud. d'Ent. x. pl. ii. fig. 11 (1884).

Two specimens, taken by my native collector at Gensan in July.
Gensan (*Nat. Coll.*); Sidemi.

127. Triphænopsis lucilla.

Triphænopsis lucilla, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 163 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 1 (1878).

Three examples, coll. Pryer.
Evidently a variable species, as although all are specifically identical each specimen is of a different form.
Yokohama (*Jonas* and *Pryer*).

128. Triphænopsis cinerescens.

Triphænopsis cinerescens, Butl. Cist. Ent. iii. p. 133 (1885).

Two specimens, coll. Pryer.
I took an example of this species at Hakodate in August.
Fujisan (*Pryer*); Hakodate (*Leech*).

129. Triphænopsis efflorescens.

Triphænopsis efflorescens, Butl. Ann. & Mag. Nat. Hist. (5) [illegible] p. 361 (1879).
Triphæna jankowskii, Oberth. Etud. d'Ent. x. p. 20, pl. ii. fig [illegible] (1884).

Four specimens, coll. Pryer.
Yokohama, Oiwake (*Pryer*); Sidemi (*Jankowski*).

130. Epilecta semiherbida.

Triphæna semiherbida, Walk. Cat. Lep. Het. xi. p. 743 (1857).
Epilecta decorata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 3[illegible] (1879).

A nice series, coll. Pryer.
Yokohama, Oiwake (*Pryer*).

131. Agriopis viridis, sp. n. (Plate LI. fig. 6.)

Verdigris-green with black markings; a short longitudinal bas[illegible] streak branched at its outer extremity, and a spot above on t[illegible] costa; inner line commencing as a spot on the costa runs oblique[illegible] inwards to median nerve, then outwards, terminating in a gent[illegible] curve on the inner margin, this line is bordered outwardly wit[illegible] white and some black dots beyond the curved portion; outer li[illegible] much angulated and indented, edged internally with white and so[illegible] black spots followed by a conspicuous dash on the costa, there a[illegible] two other black spots on the costa between the lines, and [illegible] cuneiform mark at inner angle; stigmata partially outlined wit[illegible] black, and a streak of the same colour connects the orbicular with the reniform: secondaries fuscous grey, darker posteriorly, central and outer marginal lines pale grey; fringes pale grey, preceded by a series of black lunules on outer margin. Under surface of all the

ings grey-brown, clouded with fuscous; discal lines darker, bordered
itwardly with paler.
Antennæ of the ♂ strongly pectinated, ♀ slightly serrated.
Expanse, ♂ 45 millim., ♀ 50 millim.
Allied to *A. aprilina*, but it is a broader-winged insect and there
a considerable difference in the structure of the antennæ.
Four examples, coll. Pryer.
Yokohama?

132. MISELIA EXTENSA.

Belosticta extensa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 357
879).
Miselia cinerea, Butl. Trans. Ent. Soc. 1881, p. 184.
A fine series, coll. Pryer.
This insect is very like an exaggerated form of the European
. *oxyacanthæ*, in which the primaries have become elongated.
Yokohama (*Pryer*).

133. MISELIA FUNESTA, sp. n. (Plate LI. fig. 7.)

Primaries blackish grey, mottled and clouded with paler and
-ker, and with some whitish spots on the costa; the transverse
es are indistinct, but there are traces of a short one at the base; a
es of blackish dots and streaks edged with whitish represent the
er line, this curves gently inwards from the costa to opposite the
er end of reniform, from which point it takes an oblique course
he inner margin, and intersects a black longitudinal bar above
r angle; submarginal line white, edged on both sides with
k; a series of blackish-grey oblong spots, followed and separated
white dots between submarginal line and outer margin; fringes
, intersected by a blackish line: secondaries whitish, fuscous
uter margin, traversed by two central bands. Under surface of
aries fuscous, central spot and inner margin paler; four whitish
s on costa towards apex; fringes dark grey, paler at base:
ndaries shining whitish, some darker scales over costal area;
es grey, intersected by a blackish line. Head blackish grey,
ted with white, thorax black, collar edged above with white;
gia tipped with white, abdomen grey.
xpanse 57 millim.
wo specimens, coll. Pryer.
okohama? (*Pryer*).

134. PHLOGOPHORA BEATRIX.

Phlogophora beatrix, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 193
78); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 12 (1879).
Phlogophora pallens, Oberth. Diag. Lep. Ask. p. 14 (1879);
ad. d'Ent. v. pl. iii. fig. 3 (1880).
Several specimens, coll. Pryer.
Hakodate (*Whitely, Andrews*); Yokohama, Oiwake (*Pryer*);
esso, Askold.

135. LAMPROSTICTA BELLA.

Lamprosticta bella, Butl. Trans. Ent. Soc. 1881, p. 183.

Two examples, coll. Pryer.

Tokio (*Fenton*); Yesso (*Pryer*).

136. LAMPROSTICTA VENUSTA, sp. n. (Plate LI. fig. 5.)

Primaries pale whitish green; reniform and orbicular of the ground-colour, spotted and surrounded with black; a short black basal streak; submarginal line represented by a short dash on costa, another towards middle, and an arrow-shaped mark at inner angle; costa, outer and inner margins spotted with black: secondaries greyish brown, with a fuscous central line and spot, and a broad band on outer margin; fringes chequered with dark grey and white. Under surface of primaries fuscous; costa and outer margins whitish green, spotted with black; secondaries whitish with black central line and spot, outer margin clouded with fuscous towards costa. Thorax green, variegated with black; abdomen blackish grey, segmental divisions paler.

Expanse 41 millim.

One ♀ example, coll. Pryer, without exact locality, but probably from Yokohama.

137. EUPLEXIA ALBOVITTATA.

Euplexia albovittata, Moore, Proc. Zool. Soc. 1866, p. 57, pl. vi. fig. 16; Butl. Ann. & Mag. Nat. Hist. (5) v. p. 225 (1880).

One example, coll. Pryer (no. 827).

I took a specimen at Gensan in June.

Nikko (*Pryer*); Hakodate (*Andrews*); Gensan (*Leech*); Darjeeling, Bengal, Nilgiri Hills, Sikkim, Thundiani.

138. EUPLEXIA LUCIPARA.

Phal.-Noctua lucipara, Linn. Syst. Nat. x. p. 518; Faun. Suec. 318.

Noctua lucipara, Esp. Schmett. iv. pl. 154. figs. 1–4; Hübn. Noct. fig. 55.

Phlogophora lucipara, Treit. Schmett. v. 1. 377.

Euplexia lucipara, Steph. Ill. Brit. Ent., Haust. iii. p. 1; Guen. Noct. i. p. 68.

Several specimens, coll. Pryer.

I took this species at Sendai in September, and my native collector met with it at Hakodate in June or July.

Yokohama, Oiwake, Yesso (*Pryer*); Sendai (*Leech*); Hakodate (*Nat. Coll.*); Tokio; Europe, New York.

139. EUPLEXIA JAPONICA, sp. n. (Plate LI. fig. 4.)

Primaries dark chocolate-brown, with a slight violet tinge; the area between the pale curved inner and serrated elbowed outer lines darker, and divided by a still darker longitudinal shade-like bar which encloses the claviform stigma; reniform indistinctly outlined,

the outer fourth whitish; four pale dots on costa towards apex, the fourth at commencement of pale wavy but indistinct submarginal line: secondaries dark brown, traversed by a darker transverse central line; fringes paler at the base and preceded by a blackish line. Under surface ochreous brown suffused with fuscous; dark central spot and pale submarginal line on all the wings.

Expanse, ♂ 35 millim., ♀ 37 millim.

Seven specimens, coll. Pryer.

Allied to *E. lucipara* from Europe.

140. GONOPTERA LIBATRIX.

Phal.-Bombyx libatrix, Linn. Syst. Nat. x. p. 537; Faun. Suec. p. 304.

Bombyx libatrix, Esp. Schmett. iii. pl. 69. fig. 4.

Noctua libatrix, Hübn. Noct. pl. 93. fig. 436.

Calpe libatrix, Treit. Schmett. v. 2. 172.

Calyptra libatrix, Steph. Ill. Brit. Ent., Haust. iii. p. 50.

Gonoptera libatrix, Guen. Noct. ii. p. 405.

Several specimens, coll. Pryer. I took fine examples at Gensan in July.

Yokohama, Oiwake, Gifu (*Pryer*); Gensan (*Leech*); Amur, Europe, N. America.

141. COSMOPHILA XANTHINDYMA.

Cosmophila xanthindyma, Boisd. Faune Ent. Madag., Lép. p. 94, pl. xiii. fig. 7 (1834); Guen. Noct. ii. p. 396 (1852); Moore, Lep. Ceyl. iii. p. 84, pl. 155. figs. 1, 1 *a*, 1 *b* (1884).

Cirroedia variolosa, Walk. Cat. Lep. Het. xi. p. 750 (1857).

Cirroedia edentata, Walk. Cat. Lep. Het. xi. p. 750 (1857).

Var. *Cosmophila indica*, Guen. Noct. ii. p. 396 (1852).

A nice series, coll. Pryer (no. 707).

This appears to be a very variable species. In the Japanese series before me there are forms between the type and var. *indica*, Guen.

Yokohama (*Pryer*); N. India, Ceylon, Moreton Bay, Tasmania, Sierra Leone, Congo, Madagascar, Mauritius, Isle of Bourbon, Java, Malabar.

142. GONITIS INVOLUTA.

Gonitis involuta, Walk. Cat. Lep. Het. xiii. p. 1003 (1857).

Gonitis basalis, Walk. *l. c.* p. 1004.

Tiridata colligata, Walk. *l. c.* Suppl. iii. p. 870 (1865).

I received one example of this Indian species from Mr. Manley, who captured it at Yokohama.

Yokohama (*Manley*); N. India, Ceylon.

143. GONITIS FRACTIFERA.

Gonitis fractifera, Walk. Cat. Lep. Het. xiii. p. 998 (1857).

Several specimens, coll. Pryer.

My native collector took examples at Gensan in September.

Yokohama (*Pryer*); Gensan (*Nat. Coll.*); Kiukiang (*Pratt*); S. Domingo, Honduras, Venezuela.

144. GONITIS COMBINANS.

Gonitis combinans, Walk. Cat. Lep. Het. xiii. p. 1001. no. 7 (1859).

Gonitis albitibia, Walk. *l. c.* no. 8.

Gonitis privata, Walk. C. L. H. Suppl. iii. p. 863 (1865).

Gonitis commoda, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 203 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 3 (1878).

Several specimens, coll. Pryer.

I took the species at Nagasaki in June, and Fushiki in July.

An exceedingly variable series, embracing examples of all the above-named forms.

Yokohama (*Jonas* and *Pryer*); Fushiki, Nagasaki (*Leech*); Loochoo (*Pryer*); Tokio, Shanghai, Ceylon.

145. GONITIS PRYERI, sp. n. (Plate LII. fig. 8.)

♀. Pale brown; primaries sparingly sprinkled with darker brown, and traversed by two dark lines, the outer edged externally and the inner internally with paler; a short dark apical streak; orbicular represented by a minute white dot, reniform ill-defined: secondaries with faint indications of two transverse lines. Under surface pale whitish brown; primaries with a dark central transverse line and apical streak; secondaries with an indistinct dark central line.

Expanse 45 millim.

One ♀ example, coll. Pryer.

There is an example of this species from Dharmsala in the National Museum at South Kensington.

146. GONITIS DISTINCTA, sp. n. (Plate LII. fig. 7.)

Primaries bright green, slightly orange along costal margin; discal spot minute, blackish, a pale dark-bordered oblique line traverses the outer third of wing; submarginal line wavy, slightly darker than ground-colour; fringes brownish: secondaries bright cupreous brown; fringes pale grey-brown. Under surface of primaries shining cupreous brown, paler towards inner margin; secondaries pinkish brown, with faint blackish central line and dot.

Expanse 43 millim.

Several specimens, coll. Pryer.

I took one example at Nagahama, and two at Gensan in July.

147. DICHONIA PROTEA.

Noctua protea, Borkh. iv. p. 386; Esp. Schmett. iv. pl. 150. fig. 6; Hübn. Noct. fig. 406.

Dichonia protea, Hübn. Verz. Schmett. p. 217. n. 2173.

Hadena protea, Treit. Schmett. v. 1. p. 362; Guen. Noct. ii. p. 89.

Hadena seladonia, Steph. Ill. Brit. Ent., Haust. iii. p. 23.
Var. *Dichonia intermissa*, Butl. Trans. Ent. Soc. 1886, p. 134.

A fine series, coll. Pryer.

Some examples agree well with *D. intermissa*, Butl.; these and the other specimens are most certainly referable to *D. protea*.

Yokohama (*Pryer*); Europe.

148. BERRHÆA JAPONICA, sp. n. (Plate L. fig. 11.)

Primaries pale olive-green, nervures violet-grey; abbreviated basal line whitish, bidentate, and edged externally with black; inner line whitish, shaded externally with blackish; outer line whitish, edged and clouded internally with black; these transverse lines limit a central violet-brown fascia, clouded with darker and tinged here and there with olive-green, and approximate just above the inner margin, where they, as also an oblique blackish dash from the inner margin between the basal and inner lines, are intersected by the violet submedian nerve; outer margin broadly violet-grey, dashed with olive-grey at apex, the internal edge defined by a serrated and angulated pale line; reniform olive-green, black at its lower end, its exterior edge outlined with whitish, and followed by a blackish shade; orbicular olive-green, centre blackish, outlined with paler and edged with blackish; fringes spotted with pale brown, and preceded by a series of black lunules, edged internally with olive-green: secondaries fuscous brown, central spot blackish; fringes pale brown, intersected by a darker line. Under surface of primaries fuscous brown; pale annulated central spot and darker transverse line, the former preceded by a short oblique dark costal spot: secondaries with a black central spot and dark crenate transverse line.

Expanse 46 millim.

Allied to *B. olivacea*, Moore.

Five specimens, coll. Pryer.

I took one example at Oiwake in October.

Yokohama? (*Pryer*); Oiwake (*Leech*).

149. EUROIS VIRENS.

Eurois virens, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 194 (1878); Ill. Typ. Lep. Het. iii. pl. xlv. fig. 5 (1879); Oberth. Etud. d'Ent. x. pl. ii. fig. 12.

Two specimens, coll. Pryer.

I took one example at Gensan in July.

Hakodate (*Whitely*); Gensan (*Leech*); Sidemi (*Jankowski*); N.W. Himalayas.

150. EUROIS PRASINA.

Noctua prasina, Fabr. Mant. p. 169 (1787).
Noctua egregia, Esp. Schmett. pl. 119. fig. 7.
Eurois herbida, Hübn. Verz. Schmett. p. 218. n. 2175.

Polia herbida, Treit. Schmett. v. 2. p. 56; Steph. Ill. Brit. Ent., Haust. iii. p. 30, pl. 27. fig. 3.
Aplecta herbida, Guen. Noct. ii. p. 75.
One example, coll. Pryer.
Yesso (*Pryer*); Europe, N. America.

151. EUROIS OCCULTA.

Phal.-Noctua occulta, Linn. Syst. Nat. x. p. 514; Clerck, Icon. pl. i. fig. 6.
Noctua occulta, Hübn. Noct. fig. 79.
Eurois occulta, Hübn. Verz. Schmett. p. 218. n. 2180.
Polia occulta, Treit. Schmett. v. 2. p. 52.
Aplecta occulta, Guen. Noct. ii. p. 76.
One specimen taken by my native collector at Gensan in August.
Gensan (*Nat. Coll.*); Europe, Canada.

152. EUROIS NEBULOSA.

Noctua nebulosa, Hufn. Berl. Mag. iii. p. 418.
Noctua plebeja, Hübn. Noct. fig. 78.
Noctua bimaculosa, Esp. Schmett. iv. pl. 132. figs. 1, 2.
Eurois nebulosa, Hübn. Verz. Schmett. p. 218. n. 2184.
Polia nebulosa, Treit. Schmett. v. 2. p. 48.
Aplecta nebulosa, Guen. Noct. ii. p. 77.
Several specimens, coll. Pryer.
Oiwake (*Pryer*); Europe.

153. HADENA AURIPLENA.

Eurois? auriplena, Walk. Cat. Lep. Het. xi. p. 557 (1857).
One example, coll. Pryer.
Oiwake (*Pryer*); Darjeeling, Ceylon.

154. HADENA LUCIA.

Hadena lucia, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 195 (1878); Ill. Typ. Lep. Het. iii. pl. xlv. fig. 2 (1879).
Hadena kosakka, Oberth. Etud. d'Ent. v. p. 80, pl. vii. fig. 4 (1880).
Hadena tokiensis, Butl. Trans. Ent. Soc. 1881, p. 186.
I took this species at Gensan in July, and my native collector at Hakodate.
Hakodate (*Whitely*); Tokio (*Fenton*); Hakodate (*Nat. Coll.*); Gensan (*Leech*); Askold.

155. HADENA JANKOWSKII.

Hadena jankowskii, Oberth. Etud. d'Ent. v. p. 79, pl. iii. fig. 11 (1880).
I took three examples of this species at Gensan in July.
Gensan (*Leech*); Askold, Amur.

156. HADENA UNICA, sp. n. (Plate LI. fig. 12.)

Primaries pale brown, mottled and clouded with darker, discal area faintly suffused with violet; basal line represented by a black spot on costa, and a double transverse streak between the subcostal and submedian nerves; inner and outer transverse lines blackish, the former preceded and the latter followed by fainter lines; submarginal line whitish, angulated below the costa and shaded with greyish brown; a series of triangular dark spots precede the grey-brown fringes; reniform outlined with blackish, broadly on the external and lower margins, and filled in with ground-colour except towards internal edge, where there is a greyish-brown transverse shade; orbicular large, but indistinctly outlined; claviform short, outlined in black: secondaries pale brown, exterior border darker. Under surface whitish; primaries clouded with fuscous, central line blackish, a series of ⊢-shaped marks edged with whitish on outer margin; secondaries sprinkled on the margins with fuscous scales, central spot and line blackish.

Expanse 39 millim.

One example, coll. Pryer, without exact locality.

Yokohama? (*Pryer*).

157. HADENA STOLIDA, sp. n. (Plate LI. fig. 2.)

♂. Primaries pale brown, basal area dusted, discal area suffused and clouded with darker; inner line pale, indented and edged externally with dark brown; outer line wavy and angulated above inner margin, dark brown edged internally with paler; submarginal line pale brown, indented and twice angulated at the middle; stigmata pale brown, outlined in darker, the reniform with a blackish cloud on its outer edge; orbicular with a dark central spot: secondaries pale grey-brown, darker towards outer margin; central lunule and neuration darker. Under surface fuscous brown, margins paler, costa tinged with reddish towards apex, central line blackish: secondaries whitish, sprinkled with brownish scales, and tinged with reddish on costa; outer margin clouded with fuscous, central spot black. Head pale brown, mottled with darker; thorax dark brown; collar pale brown, edged above with darker.

Expanse 36 millim.

One specimen in Pryer's collection without exact locality.

158. HADENA SATURA.

Noctua porphyrea, Esp. Schmett. iv. pl. 145. fig. 5 (1789).

Noctua satura, Hübn. Noct. pl. 16. fig. 75 (1880).

Hadena satura, Treit. Schmett. v. 1. p. 333; Guen. Noct. ii. p. 84.

A very fine and extensive series, coll. Pryer.

Yokohama (*Pryer*).

159. TRACHEA ATRIPLICIS.

Phal.-Noctua atriplicis, Linn. Syst. Nat. x. p. 517.

Noctua atriplicis, Esp. Schmett. iv. pl. 163. figs. 1–3; Hübn. Noct. fig. 83.

Trachea atriplicis, Hübn. Verz. Schmett. p. 219. n. 2203; Treit. Schmett. v. 2. p. 66.

Hadena atriplicis, Guen. Noct. ii. p. 99.

Polia atriplicis, Herr.-Schäff. Schmett. ii. p. 263.

Hadena gnoma, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 195 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 7 (1878).

Several specimens, coll. Pryer.

I took this species at Gensan in June, and my native collector at Nikko.

Yokohama (*Jonas* and *Pryer*); Oiwake, Gifu (*Pryer*); Gensan (*Leech*); Nikko (*Nat. Coll.*).

160. APLECTOIDES NITIDA.

Aplectoides nitida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 194 (1878); Ill. Typ. Lep. Het. iii. pl. xlv. fig. 1 (1879).

Several specimens, coll. Pryer.

I have received one example from Mr. Manley, of Yokohama.

Yokohama (*Jonas*, *Pryer*, *Manley*).

161. APLECTOIDES CALIGINEA.

Aplectoides caliginea, Butl. Trans. Ent. Soc. 1881, p. 185.

Three specimens, coll. Pryer.

I took a nice series at sugar in July at Gensan.

Tokio (*Fenton*); Yokohama? (*Pryer*); Gensan (*Leech*).

162. PRODENIA LITTORALIS.

Hadena littoralis, Boisd. Faun. Ent. Mad. et Maur. p. 91, pl. 13. fig. 8 (1834).

Neuria retina, Herr.-Schäff. Schmett. ii. tab. xxix. figs. 144, 145 (1846).

Prodenia retina, Guen. Noct. i. p. 163.

Several specimens, coll. Pryer.

Yokohama? (*Pryer*); Crete, Asia Minor, Madagascar, Mauritius, Madeira, Congo, N. India, Nepaul, N. China.

163. XYLOMEGES BELLA.

Xylomeges bella, Butl. Trans. Ent. Soc. 1881, p. 175.

A nice series, coll. Pryer.

Yokohama (*Pryer*).

164. PANOLIS PINIPERDA.

Phalæna piniperda, Panz. et Kob, Baumtr. Nadelw. p. 51. pl. 1. figs. 1–12 (1786).

Noctua piniperda, Loschge, Naturf. xx. p. 9 (1787); Esp. Schmett. iv. pl. 125. figs. 1–6.

Bombyx spreta, Fabr. Mant. Ins. ii. 124 (1787).

Noctua flammea, Hübn. Noct. fig. 476.

Panolis flammea, Hübn. Verz. Schmett. p. 214. n. 2134.
Trachea priniperda, Treit. Schmett. v. 2. p. 76; Guen. Noct. i. p. 340.
Panolis piniperda, Steph. Cat. Brit. Lep. p. 74.
Three specimens, coll. Pryer.
Yokohama, Gifu (*Pryer*); Europe.

165. EUPSILIA TRIPUNCTATA.

Eupsilia tripunctata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 168 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 9 (1878).
Five specimens coll. Pryer, and I have received two from Mr. Manley.
Yokohama (*Jonas*, *Pryer*, *Manley*).

166. EUPSILIA STRIGIFERA.

Eupsilia strigifera, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 363 (1879).
One example, coll. Pryer.
Yokohama (*Pryer*).

167. SEMIOPHORA PALLESCENS.

Semiophora pallescens, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 166 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 4 (1878).
Several specimens, coll. Pryer.
Mr. Pryer appears to have considered *S. pallescens*, Butl., a form of *S. gothica*; but as there is an undoubted form of *S. gothica* occurring in Japan, and as there seem to be no intermediates known which would serve to connect that form with *S. pallescens*, the latter must stand.
Yokohama (*Jonas* and *Pryer*).

168. SEMIOPHORA GOTHICA.

Phal.-Noctua gothica, Linn. Syst. Nat. x. p. 515; Clerck, Icon. pl. i. fig. 1.
Noctua gothica, Esp. Schmett. iii. pl. 76. figs. 1, 2; Treit. Schmett. v. 1. p. 233.
Noctua num-atrum, Hübn. Noct. fig. 112.
Tæniocampa gothica, Guen. Noct. i. p. 347.
Semiophora gothica, Steph. Ill. Brit. Ent., Haust. ii. p. 138.
Two specimens, coll. Pryer.
Neither are quite typical examples of *S. gothica*, but that from Gifu is nearer the type than is the other, which unfortunately is not localized. This last approaches the *gothicina* form.
Yokohama?, Gifu (*Pryer*); Europe.

169. TÆNIOCAMPA CARNIPENNIS.

Tæniocampa carnipennis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 167 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 6 (1878).
Several specimens, coll. Pryer. I have also received examples from Mr. Manley.

All the markings are subject to slight modification but the ⋈-shaped mark referred to by Mr. Butler in his description of this species varies considerably: thus in two examples the extremities alone remain distinct and these are connected by a very fine dark line; in another specimen the mark is replaced by a large quadrate black spot, and in a fourth the bar is contracted in the middle so that it forms two triangles whose apices are contiguous.

Yokohama (*Jonas*, *Pryer*, *Manley*).

170. Tæniocampa munda.

Noctua munda, Esp. Schmett. iii. pl. 52. figs. 5, 6; (*lota*) Hübn. Noct. fig. 166.

Orthosia munda, Hübn. Verz. Schmett. p. 229. n. 2293; Treit. Schmett. v. 2. p. 208.

Tæniocampa munda, Guen. Noct. i. p. 356.

Tæniocampa munda, var. *immaculata*, Staud. Cat. p. 114 (1871).

A fine series, coll. Pryer.

The majority of the specimens are larger than European *T. munda*. The series includes one example of the var. *immaculata*.

Yokohama (*Pryer*, *Manley*); Yesso (*Pryer*).

171. Tæniocampa gracilis.

Noctua gracilis, Fabr. Mant. Ins. p. 148; Hübn. Noct. pl. 35. fig. 168.

Orthosia gracilis, Treit. Schmett. v. 2. p. 217.

Tæniocampa gracilis, Guen. Noct. i. p. 355.

Tæniocampa ella, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 167 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 7 (1878).

Several specimens, coll. Pryer.

There appears to be a pale form and a dark form in Japan as in Europe, but the palest Japanese specimen I have is not quite so light as some of my European examples; whilst, on the other hand, I have not yet seen a specimen from Europe as dark as the darkest Japanese example in Pryer's series of *T. gracilis*. Butler's figure of *T. ella* represents a specimen which as regards tone of colour is intermediate between the two just adverted to.

Yokohama (*Jonas*, *Pryer*); Europe.

172. Tæniocampa instabilis.

Noctua instabilis, Esp. Schmett. iv. pl. 151. fig. 3; Hübn. Noct. pl. 35. fig. 165.

Tæniocampa instabilis, Guen. Noct. i. p. 350.

Var. *Tæniocampa evanida*, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 362 (1879).

Five specimens, coll. Pryer.

Four of these Japanese examples are larger than any European specimen I have seen of *T. instabilis*, but the fifth is of the normal size. In colour all the five specimens are pale, but I have an example

from Britain which agrees very well with them in this respect. I can only regard *T. evanida*, Butl., as an exaggerated form of *T. instabilis*.

Yokohama (*Pryer*); Europe.

173. TÆNIOCAMPA STABILIS.

Noctua stabilis, View. Tab. Verz. ii. p. 14 (1789); Hübn. Noct. fig. 171.

Tæniocampa stabilis, Guen. Noct. i. p. 354.

Several examples, coll. Pryer, under the name of *T. gracilis* (no. 787).

Yokohama (*Manley, Pryer*); Yesso (*Pryer*).

174. TÆNIOCAMPA AURORIÆ.

Tæniocampa auroriæ, Oberth. Etud. d'Ent. v. p. 76, pl. iii. fig. 6 (1880).

One specimen in Pryer's collection, and one taken by my native collector at Hakodate in June or July.

175. TÆNIOCAMPA ODIOSA.

Agrotis odiosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 8 (1879).

Yokohama (*Jonas*).

176. ORTHOSIA SUSPECTA.

Noctua suspecta, Hübn. Eur. Schmett. Noct. fig. 633.

Orthosia suspecta, Guen. Noct. i. p. 360.

Noctua congener, Freyer, Neuere Beitr. Schmetterl. iii. pl. 209. figs. 2, 3.

Noctua iners, Germ. Faun. Ins. Eur. xvi. pl. 24.

One example, coll. Pryer.

Japan (*Pryer*); Europe.

177. ORTHOSIA FAUSTA, sp. n. (Plate L. fig. 2.)

Primaries ochreous or brown, clouded with darker towards outer margin; a black spot on median nerve near the base; inner and outer lines represented by black spots; submarginal line pale, angulated below costa; fringes preceded by a row of black spots; reniform outlined in pale and filled up with blackish, below this is a dark shade to the inner margin; orbicular outlined in paler but very indistinct: secondaries fuscous brown; fringes paler. Underside fuscous brown, apical area tinged with pink, central spot and line darker but shadowy; secondaries brown tinged with pink, a distinct black costal spot, transverse central line formed of black dots.

Expanse 40 millim.

Six specimens coll. Pryer (Yesso) (*Pryer*); Yokohama (*Manley*).

The above description is taken from a male specimen in which the markings are well defined, but the characters referred to vary in intensity.

178. ORTHOSIA LIZETTA.

Orthosia lizetta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 167 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 8 (1878).

A nice series, coll. Pryer.

Yokohama (*Jonas*, *Pryer*).

179. CERASTIS FRAGARIÆ.

Bombyx fragariæ, Esp. Schmett. Bomb. pl. 86. fig. 3.

Noctua domiduca, Borkh. Eur. Schmett. iv. p. 44.

Cerastis serotina, Treit. Schmett. v. 2. p. 418; Guen. Noct. i. p. 385.

Several fine specimens, coll. Pryer.

Yokohama (*Pryer*, *Manley*); Europe.

180. CERASTIS VACCINII.

Phal.-Noctua vaccinii, Linn. Faun. Suec.

Noctua vaccinii, Esp. Schmett. iv. pl. 161. figs. 1, 4, 6; Hübn. Noct. p. 177; var. *mixta*, Staud. Cat. p. 118.

Noctua spadicea, Hübn. Noct. fig. 179; (*vaccinii*), Esp. *l. c.* fig. 2.

Cerastis vaccinii, Treit. Schmett. v. p. 401; Guen. Noct. i. p. 379.

Dasycampa ardescens, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 364 (1874).

A fine and extensive series, coll. Pryer.

D. ardescens, Butl., is a large *C. vaccinii* of the type form, and there are also specimens of the same exaggerated size which agree with the var. *mixta* of Staudinger.

Yokohama (*Pryer*); Europe.

181. CERASTIS EVELINA.

Dasycampa evelina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 363 (1879).

A fine series, coll. Pryer.

Yokohama (*Pryer*).

182. CERASTIS ALBIPUNCTA, sp. n. (Plate LI. fig. 10.)

♂. Primaries pale sandy brown; with the exception of an indistinct darker submarginal line, there are no indications of transverse markings; the reniform is represented by a white spot at its lower end, but the other portions of this stigma are not clearly defined; a series of small blackish lunules on outer margin: secondaries fuscous brown; fringes pale reddish brown. Under surface pale ochreous brown, the discal area of primaries suffused with fuscous and crossed by a darker central line; secondaries have a darker central spot and transverse line. Head and thorax colour of primaries; abdomen grey-brown above, ochreous brown beneath. Antennæ pectinated.

Expanse 42 millim.

One example, coll. Pryer, but no exact locality is given.

Yokohama? (*Pryer*).

183. Calymnia camptosigma.

Heliothis camptosigma, Mén. Bull. de l'Acad. t. xvii. p. 219; Schr. Reis. Amur. tab. v. fig. 1 ♀, fig. 2 var.

Cosmia distincta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 192 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 2 (1878); Oberth. Etud. d'Ent. vi. pl. ix. fig. 7 (1881).

Several specimens, coll. Pryer. My native collector took the species at Hakodate in July. A very variable species, both as regards colour and the definition of markings on primaries; the secondaries also may be entirely fuscous, or yellowish with a broad fuscous hind marginal band. My series from Japan and one from the Amur contain similar forms.

Tokio (*Fenton*); Yokohama (*Jonas* and *Pryer*); Hakodate (*Nat. Coll.*); Kouy-Tchéou (*Largeteau*); Amur.

184. Calymnia affinis.

Phal.-Noctua affinis, Linn. Syst. Nat. xii. p. 848.

Noctua affinis, Esp. Schmett. iv. pl. 134. fig. 1; Hübn. Noct. pl. 42. fig. 201.

Calymnia affinis, Hübn. Verz. Schmett. p. 235. n. 2351.

Cosmia affinis, Treit. Schmett. v. p. 389; Guen. Noct. ii. p. 11.

Several specimens, coll. Pryer.

I took one example at Oiwake in October 1886.

Yesso (*Pryer*); Oiwake (*Pryer, Leech*).

185. Calymnia achatina.

Cosmia achatina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 365 (1879).

Several specimens in Mr. Pryer's collection; two of these from Nikko were separated from the rest, and are referable to the No. 816 of his Catalogue. Except that they are darker in colour, I cannot see a difference between these Nikko specimens and those from Yokohama.

Nikko, Yokohama (*Pryer*).

186. Calymnia pyralina.

Noctua pyralina, View. Tab. Verz. p. 87; Hübn. Noct. fig. 203.

Noctua corusca, Esp. Schmett. iv. pl. 135. figs. 4, 5.

Eustegnia pyralina, Hübn. Verz. Schmett. p. 336. n. 2353.

Cosmia pyralina, Treit. Schmett. v. 2. 2392; Guen. Noct. ii. p. 10.

Three typical specimens, coll. Pryer.

Yesso, Oiwake (*Pryer*); Europe.

187. Calymnia trapezina.

Phal.-Noctua trapezina, Linn. Syst. Nat. x. p. 510.

Noctua trapezina, Esp. Schmett. iv. pl. 87. figs. 2, 3; Hübn. Noct. fig. 200.

Calymnia trapezina, Hübn. Verz. Schmett. p. 235. n. 2350.
Cosmia trapezina, Treit. Schmett. v. p. 383; Guen. Noct. ii. p. 9.
Mesogona exigua, Butl. Trans. Ent. Soc. 1881, p. 182.

A number of specimens, coll. Pryer.

M. exigua, Butl., is not even a striking aberration of *C. trapezina*, and no one acquainted with the variation of the species would attempt to separate Japanese examples from *C. trapezina*.

Yesso, Oiwake (*Pryer*); Tokio (*Fenton*); Europe.

188. CALYMNIA RESTITUTA.

Cosmia restituta, Walk. Cat. Lep. Het. x. p. 490 (1856).

One example, coll. Pryer (no. 812).

Yesso (*Pryer*); Nepaul.

189. CALYMNIA PRYERI, sp. n. (Plate LI. fig. 11.)

♂. Primaries olivaceous brown; two pale transverse lines traverse the disk of the wing and approach each other on the inner margin, interspace darker; there are indications of pale stigmata, but these are very indistinct; fringes brown, with pinkish tinge: secondaries pale brown, central spot and border of outer margin darker. Under surface pale brown, with a pinkish tinge; primaries with a fuscous central spot and a broad transverse band traversing the wing parallel with outer margin; secondaries with a fuscous central spot and faintly defined transverse line, terminating in a cloud at anal angle.

Expanse 40 millim.

Two specimens, coll. Pryer.

Oiwake (*Pryer*).

190. IPIMORPHA RETUSA.

Phal.-Noctua retusa, Linn. Faun. Suec. p. 321; Syst. Nat. xii. p. 858.
Noctua retusa, Esp. Schmett. iv. pl. 178. fig. 1; Hübn. Noct. fig. 214.
Ipimorpha retusa, Hübn. Verz. Schmett. p. 238. n. 2364.
Cymatophora retusa, Treit. Schmett. v. i. 80.
Noctua gracilis, Haw. Lep. Brit. p. 251.
Plastemis retusa, Boisd. Ind. Méth. p. 93. 706.
Tethea retusa, Guen. Noct. ii. p. 3.
Cosmia curvata, Butl. Trans. Ent. Soc. 1885, p. 131.

A fine series, coll. Pryer.

This insect is most certainly referable to *I. retusa*. Japanese specimens agree exactly with Austrian and S. Russian specimens in my collection.

Fukushima (*Lewis*); Yokohama, Yesso, Nikko (*Pryer*); Europe.

191. OPORINA CROCEAGO.

Noctua croceago, Fabr. Mant. Ins. ii. p. 159; Hübn. Noct. pl. 40. fig. 189.
Noctua fulvago, Hübn. Beitr. pl. i. fig. F; Esp. Schmett. pl. 176. figs. 3, 4.

Hoporina croceago, Boisd. Ind. Méth. p. 147; Guen. Noct. i. p. 389.

Hoporina sericea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 168 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 10 (1878).

A fine series, coll. Pryer.

I received one example from Mr. Manley, of Yokohama.

Yokohama (*Jonas*, *Pryer*, *Manley*); Europe.

192. Xanthia fulvago.

Phal.-Noctua fulvago, Linn. Faun. Suec. p. 312.

Noctua cerago, Fabr. Mant. p. 159; Hübn. Noct. figs. 190, 444.

Citria cerago, Hübn. Verz. Schmett. p. 234. 2345.

Xanthia cerago, Treit. Schmett. v. 2. 370; Guen. Noct. i. p. 393.

Two specimens, coll. Pryer.

One example is very typical, the other has a broad pinkish-brown transverse band before, and a narrower one of the same colour following the pale outer line.

Oiwake (*Pryer*); Europe.

193. Xanthia flavago.

Noctua flavago, Fabr. Mant. Ins. ii. p. 160 (1787); Ent. Syst. iii. 2. 76.

Noctua silago, Hübn. Noct. fig. 191.

Citria silago, Hübn. Verz. Schmett. p. 234. 2346.

Xanthia silago, Treit. Schmett. v. 2. p. 367; Boisd. Ind. Méth. p. 146. 1181; Guen. Noct. i. p. 394.

One example, coll. Pryer.

I took a specimen at Nikko in September.

Yokohama (*Pryer*); Nikko (*Leech*); Europe.

194. Brachyxanthia peculiaris.

Brachyxanthia peculiaris, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 169 (1878); Ill. Typ. Lep. Het. ii. pl. xxx. fig. 11 (1878).

Hakodate (*Whitely*); Yokohama (*Jonas*); Tokio.

195. Dasycampa rubiginea.

Noctua rubiginea, Fabr. Mant. Ins. ii. p. 142; Hübn. Noct. pl. 38. fig. 183.

Noctua tigerina, Esp. Schmett. iv. pl. 123 fig. 4.

Dasycampa rubiginea, Guen. Noct. i. p. 387.

Var. *Dasycampa fornax*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 168 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 11 (1879).

? = *Oporina castaneo-fasciata*, Motsch. Etud. Entom. 1860, p. 34.

A fine series, coll. Pryer.

Yokohama (*Jonas* and *Pryer*); Tokio (*Fenton*); Yesso (*Pryer*).

196. Dianthœcia compta.

Noctua compta, Fabr. Mant. Ins. ii. p. 169; Hübn. Noct. fig. 53; (*comta*) Esp. Schmett. iv. pl. 119. fig. 6.

Miselia compta, Treit. Schmett. v. 1. p. 389.
Dianthœcia compta, Boisd. Ind. Méth. p. 125. 989; Guen. Noct. i. p. 25.
A fine series, coll. Pryer.
Oiwake (*Pryer*); Tokio, Hakodate; Europe.

197. Dianthœcia cucubali.

Noctua cucubali, Fuessl. Neues Mag. ii. 2, p. 218 (1784); Esp. Schmett. iv. pl. 173. fig. 6; Hübn. Noct. fig. 56.
Dianthœcia cucubali, Boisd. Ind. Méth. p. 125. 996; Guen. Noct. i. p. 28.
Three examples, coll. Pryer.
I took specimens at Tsuruga in July, and my native collector at Hakodate in June or July.
Yokohama, Oiwake (*Pryer*); Tsuruga (*Leech*); Hakodate (*Nat. Coll.*); Europe.

198. Epia claripennis.

Epia claripennis, Butl. Trans. Ent. Soc. 1886, p. 134.
One unnamed example, coll. Pryer (no. 824).
The specimen in National Collection at South Kensington is not in good condition.
Nikko (*Pryer*).

199. Hyblæa puera.

Phalæna-Noctua puera, Cram. Pap. Exot. pl. 103. figs. D, E (1777).
Noctua saga, Fabr. Mant. Ins. ii. p. 137 (1787).
Hyblæa saga, Fabr. Ent. Syst. iii. 2. p. 128 (1794).
Noctua unxia, Hübn. Noct. fig. 513.
Enchesia unxia, Hübn. Verz. Schmett. p. 221. 2217.
Hyblæa puera, Guen. Noct. ii. p. 390.
Hyblæa fortissima, Butl. Trans. Ent. Soc. 1881, p. 191.
One example in the National Collection from Japan. I have specimens from Loochoo and Chang Yang.
Tokio (*Fenton*); N. India, Nepaul, China, South Africa, Honduras, Larnaca, &c.

200. Xanthodes transversa.

Xanthodes transversa, Guen. Noct. ii. p. 211 (1852).
Xanthodes intersepta, Guen. *l. c.* p. 212.
Xanthodes migrator, Walk. Cat. Lep. Het. xii. p. 779 (1857).
A few specimens, coll. Pryer, from Loochoo.
I took one example at Hakone in August, and my native collector obtained one at Gensan in September.
Hakone (*Leech*); Gensan (*Nat. Coll.*); Loochoo (*Pryer*); Java, Silhet, Central and North India, Australia, Malta.

201. Mesogona contracta.

Mesogona contracta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 169 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 1 (1878).

Several specimens, coll. Pryer.

Yokohama (*Jonas*, *Manley*, *Pryer*).

202. Mesogona divergens.

Mesogona divergens, Butl. Ann. & Mag. Nat. Hist (5) iv. p. 364 (1879).

A nice series, coll. Pryer.

Yokohama, Oiwake (*Pryer*).

203. Mesogona quadrilinea, sp. n. (Plate LI. fig. 1.)

♀. Pale cinnamon-brown, with an abbreviated basal and three transverse central reddish-brown parallel lines; submarginal line waved, pale, and shaded with darker: secondaries rather darker than primaries. Under surface fuscous brown, tinged with reddish brown on costa and outer margins of primaries and the costal half of secondaries; a dark central transverse line on each wing and a small dark discal spot on secondaries.

Expanse 47 millim.

Two specimens, coll. Pryer, without exact locality, but probably from Yokohama.

204. Gortyna acuminata.

Gortyna acuminata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 83 (1878); Ill. Typ. Lep. Het. ii. pl. xxix. fig. 1.

Several specimens, coll. Pryer.

I took one example at Nikko in September, and I have received two specimens from Mr. Manley.

Yokohama (*Jonas*, *Pryer*, *Manley*); Nikko (*Leech*).

205. Heliothis armigera.

Noctua armigera, Hübn. Noct. fig. 370.

Heliothis armigera, Treit. Schmett. v. 3. p. 230; Guen. Noct. ii. p. 181.

Several specimens, coll. Pryer.

My native collector took this species at Gensan in July.

Fujisan, Yokohama (*Pryer*); Gensan (*Nat. Coll.*); Fushiki; Europe, Moreton Bay, New Zealand, Rio Janeiro, Port Natal, Congo, Sidney, Venezuela, Georgia, Australia, Jamaica, Mexico, N. India, Ceylon, Cape.

206. Heliothis succinea.

Heliothis succinea, Moore, Proc. Zool. Soc. 1881, p. 362.

Several specimens, coll. Pryer. My native collector took the species at Gensan in July, and I have recieved it from Chang Yang and Ichang.

Japan (*Pryer*); Gensan (*Nat. Coll.*); N. China, N. India.

207. Heliothis dipsaceus.

Phal.-Noctua dipsacea, Linn. Syst. Nat. xii. p. 856.
Noctua dipsacea, Esp. Schmett. iv. pl. 172. figs. 1–3; Hübn. Noct. fig. 311.
Heliothis dipsacea, Treit. Schmett. v. 3. p. 220; Guen. Noct. ii. p. 181.
Heliothis adaucta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 199 (1878); Ill. Typ. Lep. Het. pt. iii. pl. xlv. fig. 4 (1879).

A few specimens, coll. Pryer.
I took this species at Gensan in June and July.
Hakodate (*Whitely*); Yesso (*Pryer*); Yokohama (*Jonas and Pryer*); Gensan (*Leech*); Europe.

208. Heliothis furvens.

Heliothis furvens, Butl. Trans. Ent. Soc. 1881, p. 186.

One example, coll. Pryer.
Tokio (*Fenton*); Yokohama? (*Pryer*).

209. Heliothis scutosus.

Noctua scutosa, Schiff. Wien. Verz. p. 89; Esp. Schmett. iv. pl. 108. figs. 1, 2; Hübn. Noct. fig. 309.
Heliothis scutosa, Treit. Schmett. v. 3. p. 224; Guen. Noct. ii. p. 182.

Not represented, coll. Pryer. My native collector took two specimens at Gensan in July and August.
Gensan (*Nat. Coll.*); Europe, Ukraine.

210. Chariclea umbra.

Noctua umbra, Hufn. Berl. Mag. iii. p. 294 (1767); Rottenburg, Naturf. ix. p. 115.
Noctua marginata, Fabr. Syst. Ent. p. 610 (1775).
Noctua rutilago, Hübn. Noct. fig. 185.
Noctua umbrago, Esp. Schmett. iv. pl. 187. figs. 7, 8.
Noctua conspicua, Borkh. Eur. Schmett. iv. p. 50.
Heliothis marginata, Treit. Schmett. v. 3. p. 232; Guen. Noct. ii. p. 178.
Chariclea umbra, Staud. Catal. Lep. Eur. p. 130.

A few specimens, coll. Pryer.
My native collector took an example at Gensan in July.
Oiwake, Fujisan (*Pryer*); Gensan (*Nat. Coll.*); Europe.

211. Phyllophila obliterata.

Anthophila obliterata, Ramb. Ann. Soc. Ent. Fr. ii. p. 27, pl. 2. fig. 17 (1833).
Anthophila wimmerii, Treit. Suppl. x. p. 148 (1835); Boisd. Ind. Méth. 174. 1391.
Phyllophila wimmerii, Guen. Noct. ii. p. 254.

Phyllophila cretacea, Butl. Ill. Typ. Lep. Het. iii. p. 28, pl. xlvii. fig. 11 (1879).

There were specimens in Pryer's collection, and I took two examples at Gensan in July.

The Japanese specimens agree very well with *A. obliterata*, Ramb., which Guenée considers to be a variety of *A. wimmerii*, Treit.; but as it has two years' priority, Rambur's name must stand for the species.

Yokohama? (*Pryer*); Gensan (*Leech*); Europe.

212. PROTHYMIA VIRIDARIA.

Phalæna viridaria, Clerck, Icon. pl. 9. fig. 12 (1759).
Noctua ænea, Hübn. Noct. figs. 350, 654.
Prothymia ænea, Hübn. Verz. Schmett. p. 282. n. 2765.
Phytometra ænea, Steph. Ill. Brit. Ent., Haust. iii. p. 121; Guen. Noct. iii. p. 298.
Anthophila ænea, Treit. Schmett. v. 3. p. 274; Dup. Lép. Fr. vii. pl. 123. fig. 5.

Yokohama? (*Pryer*); Europe.

213. ANTHOPHILA PARADISEA.

Anthophila paradisea, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 199 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 4 (1878).

A good series, coll. Pryer.

Tokio, Nikko (*Pryer*).

214. ANTHOPHILA HEMIRHODA.

Micra hemirhoda, Walk. Cat. Lep. Het. Suppl. iii. p. 799 (1865).
Anthophila roseifascia, Walk. *l. c.* p. 803.
Anthophila hæmorrhoida, Moore, Proc. Zool. Soc. 1867, p. 61.
Thalpochares adulans, Feld. Reise Nov. pl. 108. fig. xi.

One specimen, coll. Pryer (n. 877, *Anthophila*? sp.).

Nikko (*Pryer*); Bengal, Java, Ceylon.

215. ANTHOPHILA SEMIPURPUREA.

Anthophila semipurpurea, Walk. Cat. Lep. Het. Suppl. iii. p. 803 (1865).
Rhodaria amata, Butl. Ill. Typ. Lep. Het. iii. p. 72, pl. lvii. fig. 11 (1879).

One example, coll. Pryer.

I took examples of this species at Nagasaki in June and at Gensan in July. I have also received specimens from Mr. Manley.

Yokohama (*Manley* and *Pryer*); Nagasaki, Gensan (*Leech*).

216. ANTHOPHILA HEBESCENS.

Anthophila hebescens, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 366 (1879).

Six examples, coll. Pryer.

Yokohama (*Pryer*).

217. POAPHILA MOLLIS.

Poaphila mollis, Butl. Ill. Typ. Lep. Het. iii. p. 28, pl. xlvii. fig. 10 (1879).

Several specimens, coll. Pryer (unnamed).

Japan (*Pryer*); Yokohama (*Jonas* and *Manley*).

218. HYDRELIA UNCA.

Phal.-Tortrix uncula, Clerck, Icon. pl. iii. fig. 7 (1759).

Phal.-Tortrix unca, Linn. Faun. Suec. p. 342 (1761).

Phælana unca, Schifferm. Wien. Verz. p. 91 (1776).

Noctua unca, Esp. Schmett. iv. pl. 164. fig. 7; Hübn. Noct. fig. 293.

Erastria unca, Treit. Schmett. v. 3. p. 253.

Hydrelia unca, Guen. Noct. ii. p. 235.

One specimen, coll. Pryer.

I took two examples at Hakodate in August.

Oiwake (*Pryer*); Hakodate (*Leech*); Europe.

219. LEOCYMA ATRATA.

Chasmina atrata, Butl. Ann. & Mag. Nat. Hist. (5) xiii. p. 274 (1884).

A nice series, coll. Pryer.

Yesso (*Pryer*).

220. LEOCYMA ALBONITENS.

Acontia albonitens, Brem. Bull. Acad. Sci. Pét. iii. p. 581 (1861).

Leocyma albonitens, Brem. Lep. Ost-Sib. p. 55, pl. v. fig. 15 (1864).

Several specimens, coll. Pryer.

I took examples of this species at Gensan in July, and Hakodate in August. The Gensan specimens are rather larger than those from Japan.

Oiwake, Yesso (*Pryer*); Hakodate, Gensan (*Leech*); Amur.

221. LEOCYMA NERVOSA.

Leocyma nervosa, Butl. Trans. Ent. Soc. 1881, p. 187.

One example, coll. Pryer.

I took a specimen at Nagahama in July, and my native collector obtained one at Hakodate in June or July.

Tokio (*Fenton*); Yokohama? (*Pryer*); Nagahama (*Leech*); Hakodate (*Nat. Coll.*).

222. LEOCYMA NIGRILINEA, sp. n. (Plate LI. fig. 8.)

♀. Silvery white; primaries traversed by a curved central blackish line; a series of blackish dots on outer margin; fringes grey-brown: secondaries with a broad grey-brown band on outer margin, but not extending to anal angle; fringes white, preceded by a blackish line. Under surface of primaries fuscous brown, except on the inner margin, which is broadly silvery; costa and some longitudinal streaks whitish

secondaries silvery white, with a dark central transverse and marginal line.

Expanse 31 millim.

One example, coll. Pryer, taken at Kioto.

223. ANTHŒCIA? SIGILLATA.

Anthœcia? sigillata, Mén. Bull. de l'Acad. xvii. p. 219; Schr. Am. Reis. p. 60, pl. v. fig. 3 (1859).

A few specimens, coll. Pryer.

My native collector took specimens at Hakodate in June and July, and I took some there in August.

Oiwake (*Pryer*); Hakodate (*Leech*); Amurland.

224. ACONTIA BIPLAGIATA.

Acontia biplaga, Walk. Cat. Lep. Het. xii. p. 795 (1857).

Acontia biplagiata, Walk. *l. c.* Suppl. iii. p. 781 (1865); Butl. Ill. Typ. Lep. Het. iii. p. 19, pl. xlv. fig. 7 (1879).

Not represented in coll. Pryer.

I took specimens at Fusan in June, Tsuruga and Shimonoseki in July, and my native collector obtained some at Ningpo in June, at Gensan in July, and at Nikko.

Tsuruga, Fusan, Shimonoseki (*Leech*); Nikko, Ningpo, Gensan (*Nat. Coll.*); N. China (*Fortune*); Nankow Pass (*Swinhoe*).

225. ACONTIA NOLOIDES.

Acontia noloides, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 366 (1879).

Several specimens, coll. Pryer.

Yokohama, Yesso (*Pryer*); Ningpo.

226. ACONTIA SIGNIFERA.

Acontia signifera, Walk. Cat. Lep. Het. xii. p. 793.

Acontia subfixa, Walk. Cat. Lep. Het. Suppl. v. p. 1964.

A nice series, coll. Pryer.

I took examples of this species at Nagasaki in June, and my native collector at Gensan in September.

Yokohama (*Manley* and *Pryer*); Nagasaki (*Leach*); Gensan (*Nat. Coll.*); Tokio, N. India, Shanghai, Ceylon, Natal.

227. ACONTIA VIALIS.

Acontia vialis, Moore, Descr. Ind. Lep. Atk. ii. p. 135 (1882).

Five fine examples, coll. Pryer.

Yokohama, Yesso (*Pryer*); Darjeeling, Nilgiri Hills, Dharmsala.

228. ACONTIA AREFACTA.

Acontia arefacta, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 366 (1879).

A fine series, coll. Pryer.

I took specimens at Foochau in April, in Satsuma in May, and at

Nagasaki in June. My native collector met with examples at Ningpo in June.

Yokohama (*Pryer*); Satsuma, Nagasaki, Foochau (*Leech*); Ningpo (*Nat. Coll.*); Chekiang.

229. ACONTIA BICOLORA.

Acontia bicolora, Leech, Trans. Ent. Soc. 1889, p. 133. n. 178.

Three specimens, coll. Pryer.

I took specimens at Nagasaki and Satsuma in May, and my native collector at Ningpo in June and July, Gensan in August.

Japanese specimens of both sexes agree exactly with the types, which were from Kiukiang in China.

Yokohama? (*Pryer*); Nagasaki and Satsuma (*Leech*); Ningpo, Gensan (*Nat. Coll.*); Kiukiang (*Pratt*); Chekiang.

230. ACONTIA PULCHELLA, sp. n. (Plate LIII. fig. 10.)

♂. White; primaries blackish, submarginal band and two costal patches sprinkled with silvery scales, the first spot has something of the character of an abbreviated fascia, and the second is quadrate and oblique; the internal edge of marginal band, which does not reach the costa, is indented at the middle and curved towards inner margin; its external edge is defined in whitish and indented below apex and again before inner margin; the outer margin and fringes dark chocolate-brown; between second costal mark and apex are some grey-brown spots; secondaries clouded with brownish towards outer margin, especially on costal half. Under surface of primaries fuscous brown, inner margin whitish; secondaries white, tinged with brownish on costa.

Expanse 19 millim.

One specimen, coll. Pryer (Cat. no. 89).

Ohoyama (*Pryer*).

231. ERASTRIA FLAVIPUNCTA, sp. n. (Plate LIII. fig. 3.)

♂. Primaries violet-grey clouded with darker grey, basal patch pale dusky brown, limited by a slender darker line, before the middle of inner margin is a dark-grey irregular-shaped blotch outlined with blackish, above this is a band of pale reddish grey, and beyond a rusty brown band, the exterior edge of which is bounded by a dark line followed by a whitish one; a pale yellow oval spot is placed in the brown band at the upper exterior edge of the grey blotch, and beyond the band are some black dots and a small rusty-brown cloud, the former indicating a transverse elbowed line: secondaries pale grey-brown, central spot blackish. Under surface pale brown, margins of primaries clouded with fuscous, central spot and line of secondaries blackish. Head and thorax violet-grey; abdomen pale brown.

Expanse 24 millim.

One specimen, coll. Pryer.

Yokohama (*Pryer*).

232. ERASTRIA FLAVICOLLIS, sp. n. (Plate LIII. fig. 4.)

♀. Primaries violet-grey, a black longitudinal streak from middle of base; the elongated white reniform stigma has a dark grey spot at its lower end and is preceded and followed by a yellowish suffusion, which in turn is bordered with blackish; apical third clouded with blackish; submarginal line only traceable as a pale streak on costa before apex: secondaries pale fuscous grey. Under surface of primaries fuscous, paler on the costa towards apex; central spot large, whitish; some indistinct traces of darker transverse lines: secondaries whitish grey, darker on costa; central line and spot blackish.

Expanse 28 millim.

One example, coll. Pryer.

Oiwake (*Pryer*).

233. ERASTRIA COSTIMACULA.

Erastria costimacula, Oberth. Etud. d'Ent. v. p. 83, pl. iv. fig. 4 (1880).

Six specimens, coll. Pryer.

Japan (*Pryer*); Askold.

234. ERASTRIA SENEX.

Erastria senex, Butl. Trans. Ent. Soc. 1881, p. 189.

Several examples, coll. Pryer.

I took specimens at Nagasaki in June.

Tokio (*Fenton*); Nagasaki (*Leech*); Yokohama (*Pryer*).

235. ERASTRIA AFRICANA.

Erastria africana, Feld. R. N. cviii. fig. 6.

Erastria nemorum, Oberth. Etud. d'Ent. v. p. 82, pl. iv. fig. 2 (1880).

A good series, coll. Pryer.

I took a number of specimens at Gensan in June.

Yokohama? (*Pryer*); Gensan (*Leech*); Askold, N. India.

236. ERASTRIA CANDIDULA.

Noctua candidula, Borkh. Eur. Schmett. iv. p. 196; Hübn. Noct. pl. 60. fig. 295.

Erastria candidula, Treit. Schmett. v. p. 263; Guen. Noct. ii. p. 228.

A few specimens, coll. Pryer (no. 874).

I took several examples at Gensan in July, and my native collector obtained some at Hakodate in June or July.

The dark markings are more distinctly defined than in European specimens.

Gensan (*Leech*); Hakodate (*Nat. Coll.*); Yesso (*Pryer*); Tokio.

237. ERASTRIA FENTONI.

Erastria fentoni, Butl. Trans. Ent. Soc. 1881, p. 190.

A fine series, coll. Pryer.

I took a few specimens at Gensan in July.

Tokio (*Fenton*); Oiwake, Yokohama (*Pryer*); Gensan (*Leech*).

238. ERASTRIA FASCIANA.

Phal.-Tortrix fasciana, Linn. Faun. Suec. p. 342 (1761); Syst. Nat. xii. p. 375.

Noctua fuscula, Borkh. Eur. Schmett. iv. p. 192; Hübn. Noct. pl. 60. fig. 297.

Noctua polygramma, Esp. Schmett. iv. pl. 146. fig. 7.

Erastria fuscula, Treit. Schmett. v. 3. p. 257; Guen. Noct. ii. pl. 229.

Bryophila guenei, Fallon, Ann. Soc. Ent. Fr. 1864, p. 27, pl. i. fig. 3.

Erastria stygia, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 199 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 2 (1879).

Several specimens, coll. Pryer.

I took examples at Fushiki and Gensan in June and July, and my native collector at Ningpo in July.

Varies in colour from grey-brown to fuscous brown, and the white markings are very inconstant in character; the white fascia on outer margin is more particularly subject to considerable modification. In some examples this is only represented by a short thin white edging to the second discal transverse line.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Fushiki, Gensan (*Leech*); Europe.

239. ERASTRIA OLIVACEA, sp. n. (Plate LIII. fig. 1.)

Primaries olive-grey, basal line blackish, angulated just below costa; outer line curved and angulated, blackish, commencing in a white spot on costa; submarginal line white, with an interrupted edging of the ground-colour; external margin white, black at apex; reniform white, indistinctly outlined, with a median olive-grey suffusion; orbicular and a round spot below separated by the median nerve, whitish, the centre of each more or less filled up with olive-grey; fringes white, spotted with olive-grey: secondaries fuscous grey. Under surface of primaries fuscous, paler from middle of costa to apex; a small patch of black scales on costa and beyond a short pale oblique streak edged internally with blackish; fringes whitish, intersected by an interrupted blackish line and tipped with black: secondaries whitish, thickly sprinkled with brownish scales along costa and on outer margin, central spot and line blackish.

Expanse, ♂ 25 millim., ♀ 21 millim.

Allied to *E. fasciana*.

Several specimens, coll. Pryer.

I took examples at Gensan in July 1886.

Oiwake (*Pryer*); Gensan (*Leech*); Chang Yang (*Pratt*).

240. Erastria brunnea, sp. n. (Plate LIII. fig. 2.)

Primaries pale reddish brown; orbicular whitish, centred with brown and surmounted by a whitish cloud on the costa, below is an indistinct annulated whitish spot; reniform outlined with whitish and filled in with reddish brown, followed by a curved and slightly angulated whitish line, which commences in a white blotch on the costa and is edged with dark brownish; between the stigmata is a dark brown shade extending to the costa; submarginal line whitish, angulated near the costa, and indented above the inner margin with three short longitudinal dashes from the middle of its inner edge; fringes grey-brown, intersected by a brown line and preceded by a series of brownish linear spots on external margin: secondaries pale fuscous. Under surface of primaries brown, cupreous brown on margins; central line darker, but only clearly defined on the costa; fringes grey, intersected by a darker line and tipped with brownish: secondaries whitish brown, darker and tinged with cupreous on costa and external margin, central line and spot blackish.

Expanse 24 millim.

Five specimens, coll. Pryer, without exact locality (Cat. no. 892).

Allied to *E. olivacea*.

Yokohama? (*Pryer*).

241. Erastria rosacea, sp. n. (Plate LIII. fig. 9.)

Primaries olive-brown; inner indented line and small patch at base pinkish, followed by a large square patch of the same colour on costa, in the lower portion of which is a black colon-like spot, and below this an olive-brown centred pinkish spot; reniform pinkish, with an olive-brown line towards its inner edge; outer line dark, wavy and indented, bordered on both sides with pinkish; submarginal line pinkish; a row of blackish linear spots precedes the pinkish fringes, these last are intersected by a grey-brown line: secondaries fuscous, fringes paler with a dark central line. Under surface fuscous, margins of primaries and basal half of secondaries paler, the latter with a black central spot.

Expanse, ♂ 22 millim., ♀ 25 millim.

Two examples of each sex, coll. Pryer.

Allied to *E. fasciana*.

Oiwake (*Pryer*).

242. Erastria atrata.

Erastria atrata, Butl. Trans. Ent. Soc. 1881, p. 188.

Erastria sidemiata, Oberth. Etud. d'Ent. x. p. 25, pl. iii. fig. 6 (1884).

Several specimens, coll. Pryer.

Tokio (*Fenton*); Oiwake, Yokohama (*Pryer*); Amur.

243. Erastria squalida, sp. n. (Plate LII. fig. 9.)

♀. Primaries pale brown with a faint purplish suffusion, inner line runs obliquely from the costa to middle of wing, where it curves inwards and upwards and then turning abruptly descends obliquely

to the inner margin; following this line is a dark elongated quadrate blotch, edged narrowly with black, and its lower end terminating in a short black bar, a similar bar lies beyond and near the costa, and following this is a curved and indented pale line; before the apex are two short black streaks; submarginal line pale, but not distinctly defined; reniform paler, indistinct, below this is a dark shade to inner margin: secondaries grey-brown. Under surface pale brown, primaries suffused with darker, central line dark, edged externally with paler; secondaries have a dark, central spot and crenate transverse line.

Expanse 30 millim.

♂, Nagasaki, June (*Leech*); Ningpo, June, ♂ ♀ (*Nat. Coll.*).

The female specimen, being in better condition than either of the males, has been described; but there does not appear to be any difference in the character of markings in the sexes.

244. ERASTRIA SECURIFERA.

Erastria securifera, Walk. Journ. Linn. Soc. vii. p. 58.

One example, coll. Pryer.

Japan (*Pryer*); Borneo.

245. AGROPHILA TRABEALIS.

Pyralis trabealis, Scop. Ent. Carn. p. 40 (1763).

Phal.-Pyralis sulphuralis, Linn. Syst. Nat. xii. p. 881 (1766).

Noctua trabeata, Scriba, Beitr. pl. 10. fig. 8.

Noctua sulphurea, Esp. Schmett. iv. pl. 164. fig. 6; Hübn. Noct. pl. 60. fig. 291.

Erastria sulphurea, Treit. Schmett. v. 251; (*sulphuralis*) Steph. Ill. Brit. Ent., Haust. iii. p. 117.

Agrophila sulphuralis, Guen. Noct. ii. p. 206.

A nice series, coll. Pryer.

My native collector took specimens at Hakodate in June or July, and at Gensan in September.

Varies in the amount of black on primaries.

Oiwake, Yesso (*Pryer*); Hakodate, Gensan (*Nat. Coll.*); Europe.

246. ACANTHOLIPES METALLIGERA.

Acantholipes metalligera, Butl. Trans. Ent. Soc. 1881, p. 190.

Tokio (*Fenton*).

247. METHORASA THWAITESII.

Methorasa thwaitesii, Moore, Lep. Ceyl. iii. p. 61, pl. 151. fig. 2 (1884).

One specimen, coll. Pryer, without locality (no. 894).

Japan (*Pryer*); Ceylon.

248. OZARBA PUNCTIGERA.

Ozarba punctigera, Walk. Cat. Lep. Het. Suppl. ii. p. 685 (1865).

Several examples, coll. Pryer.

I took specimens in Satsuma in May, Mr. Andrews at Hakodate in August, and my native collector at Gensan also in August.

Yokohama (*Pryer*); Satsuma (*Leech*); Hakodate (*Andrews*); Gensan (*Nat. Coll.*); China; Moreton Bay, Australia.

249. Oræsia emarginata.

Noctua emarginata, Fabr. Ent. Syst. iii. 2. 240.
Oræsia emarginata, Guen. Noct. ii. p. 363 (1852).
Oræsia alliciens, Walk. Cat. Lep. Het. xii. p. 945. no. 6 (1857).
Oresia tentans, Walk. *l. c.* no. 7.

Five examples, coll. Pryer.

My native collector took examples commonly at Gensan in August. An extensive range of variation is exhibited; some of the specimens agree with *O. alliciens*, Walk., others with *O. tentans*, Walk., but both are connected by intermediates with *O. emarginata*.

Nikko (*Pryer*); North India, Ceylon, Coromandel Coast.

250. Calpe lata.

Calpe lata, Butl. Trans. Ent. Soc. 1881, p. 21.

One example, coll. Pryer.

I took a specimen of this fine species at Gensan and another at Fushiki in July.

Tokio (*Fenton*); Asamayama (*Pryer*); Gensan, Fushiki (*Leech*).

251. Calpe capucina.

Bombyx capucina, Esp. Schmett. iii. pl. 81. figs. 1–3 (1789).
Bombyx thalictri, Borkh. Eur. Schmett. iii. p. 425 (1790); Hübn. Bomb. pl. 6. fig. 25.
Calpe thalictri, Ochs. Schmett. iv. p. 78; Treit. Schmett. v. 2. 169; Guen. Noct. ii. p. 374.
Calpe sodalis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 203 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 2 (1878).

Several specimens, coll. Pryer.

I took this species at Gensan in June and July, Nagahama in July, and Hakodate in August.

Japanese and Corean specimens cannot be separated from European examples of *C. capucina*.

Hakodate (*Whitely* and *Leech*); Yokohama, Oiwake (*Pryer*); Nagahama, Gensan (*Leech*).

252. Calpe excavata.

Calpe excavata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 202 (1878); Ill. Typ. Lep. Het. xxxii. fig. 1 (1878).

A fine series, coll. Pryer.

I took an example at Gensan in July.

In his Catalogue Mr. Pryer says of the larva of this species that it "spins a cocoon interwoven with strips of fibre on the stems of trees."

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Gensan (*Leech*); Tokio, Chekiang, Kiukiang.

253. PLUSIA EXCELSA.

Plusia excelsa, Kretschmar, Berl. ent. Zeit. 1862, p. 135, pl. i. fig. 5.

Plusia metabractea, Butl. Trans. Ent. Soc. 1881, p. 190.

A specimen which I took at Nemoro in August agrees exactly both with *P. excelsa*, Kretschmar, and *P. metabractea*, Butl. It is very like *P. bractea*, and is possibly only a form of that species.

Tokio (*Fenton*); Nemoro (*Leech*); Russia, Ural, Altai.

254. PLUSIA AGRAMMA.

Plusia agramma, Guen. Noct. ii. p. 327 (1852).

Six specimens, coll. Pryer.

Yckohama? (*Pryer*); Ceylon, Java.

255. PLUSIA LEONINA.

Plusia leonina, Oberth. Etud. d'Ent. x. p. 26, pl. iii. fig. 11 (1884).

Plusia humeralis, Butl. Trans. Ent. Soc. 1886, p. 135.

Three examples, coll. Pryer.

Sidemi (*Jankowski*); Yesso (*Pryer*).

256. PLUSIA CHRYSON.

Noctua chryson, Esp. Schmett. iv. pl. 141. fig. 2 (1789).

Noctua orichalcea, Hübn. Noct. pl. 57. fig. 278.

Plusia orichalcea, Treit. Schmett. v. 173; Guen. Noct. ii. p. 334.

Four examples, coll. Pryer, and one taken by my native collector at Gensan. In the Gensan specimen the gold spot is only well defined within the submarginal line.

Yokohama, Oiwake (*Pryer*); Gensan (*Nat. Coll.*); Europe.

257. PLUSIA CHRYSITIS.

Phal.-Noctua chrysitis, Linn. Syst. Nat. x. p. 513.

Noctua chrysitis, Esp. Schmett. iv. pl. 109. fig. 5; Hübn. Noct. pl. 56. fig. 272, pl. 145. figs. 662, 663.

Plusia chrysitis, Treit. Schmett. v. 169; Guen. Noct. ii. p. 335.

Var. *Plusia nadeja*, Oberth. Etud. d'Entom. v. p. 84, pl. iii. fig. 10 (1880).

Three examples, coll. Pryer.

I took specimens at Gensan in June and Hakodate in August.

Although it would seem to be the only form occurring there, the variety of *P. chrysitis* to which Oberthür has given the name of *nadeja* is not peculiar to Japan, Corea, or Isle of Askold. I have such specimens in my European series of the species, and it is not an uncommon thing to find even British examples in which the central dark fascia of primaries is more or less completely divided into two portions.

Yokohama, Nikko (*Pryer*); Hakodate, Gensan (*Leech*); Isle of Askold; Europe.

258. Plusia zosima.

Plusia zosima, Hübn. Schmett. Noct. fig. 651; Guen. Noct. ii. p. 334.

Three specimens, coll. Pryer.

Yokohama (*Pryer*); Ural, Europe.

259. Plusia chrysitina.

Phalæna chrysitina, Martyn, Psyche, pl. 21 (1797).

Noctua aurifera, Hübn. Noct. pl. 98. fig. 463.

Plusia aurifera, Treit. Schmett. iii. 168; Guen. Noct. ii. p. 335.

Several specimens, coll. Pryer.

I took a ♂ example at Satsuma in May and another at Tsuruga in July.

Yokohama (*Pryer*); Tsuruga, Satsuma (*Leech*); N. India, Senegal, Madagascar, Bourbon, Mauritius, Java, St. Helena, Teneriffe, S. Europe.

260. Plusia festucæ.

Phal.-Noctua festucæ, Linn. Syst. Nat. x. p. 513.

Noctua festucæ, Esp. Schmett. iv. pl. 113. fig. 6; Hübn. Noct. pl. 57. fig. 277.

Plusia festucæ, Treit. Schmett. v. 165; Guen. Noct. ii. p. 337.

Several specimens, coll. Pryer.

I took two examples at Tsuruga and two at Fushiki in July; these are unusually small and agree with three of Pryer's specimens from Oiwake.

Yokohama, Oiwake (*Pryer*); Tsuruga, Fushiki (*Leech*); Europe, N. America.

261. Plusia signata.

Noctua signata, Fabr. Ent. Syst. iii. p. 234.

Plusia signata, Guen. Noct. ii. p. 345.

Five specimens, coll. Pryer.

Probably a form of *P. chalcitis* from Europe.

Yokohama (*Pryer*); Loochoo, Java, N. India.

262. Plusia verticillata.

Plusia verticillata, Walk. Cat. Lep. Het. xii. p. 923 (1857).

A few examples, coll. Pryer.

I took examples in Satsuma in May, at Fushiki and Gensan in July.

Yokohama (*Pryer*); Satsuma, Fushiki, Gensan (*Leech*); N. India, China, Australia, Ceylon.

263. Plusia c-aureum.

Phalæna c-aureum, Knoch, Beitr. i. p. 7, pl. i. fig. 2(1781).

Noctua concha, Fabr. Mant. 161 (1787); Hübn. Noct. pl. 59. fig. 287, pl. 97. fig. 458.

Plusia concha, Treit. Schmett. v. 161.

Plusia mikadina, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 202 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 7.

I took an example at Fushiki in July, and there was one specimen in Pryer's collection labelled No. 899, Oiwake; all are referable to *P. c-aureum* and are identical with *P. mikadina*, Butl.

Yokohama, Oiwake (*Pryer*); Fushiki (*Leech*).

264. PLUSIA ALBOSTRIATA.

Plusia albostriata, Brem. & Grey, Beitr. zur Schmett.-Fauna des Nördl. p. 18. China's, 1853.

Several examples, coll. Pryer.

I took specimens at Gensan and received specimens from Ningpo in July.

The only differences that I can find between this insect and *P. gutta* are perhaps rather of a varietal than specific value. Thus the silver V-like mark is of a heavier character in *P. albostriata* than in *P. gutta*, and the last-named insect lacks the short linear silver mark at the end of discal cell, which appears to be the distinguishing character of *P. albostriata*.

Yokohama, Oiwake (*Pryer*); Gensan, Ningpo (*Leech*); N. China.

265. PLUSIA GUTTA.

Noctua circumflexa, Esp. Schmett. iv. pl. iii. figs. 5, 6; Hübn. Noct. pl. 58. fig. 285 (non Linn.).

Plusia gutta, Guen. Noct. ii. p. 346.

Several examples, coll. Pryer.

I took specimens at Gensan in July, and Hakodate in August.

Yokohama, Yesso (*Pryer*); Hakodate, Gensan (*Leech*).

266. PLUSIA TYPINOTA.

Plusia typinota, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 201 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 10 (1878).

Appears to be a poor example of *P. gamma*.

Yokohama (*Jonas*).

267. PLUSIA JESSICA.

Plusia jessica, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 201 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 6 (1879).

Plusia serena, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 368 (1879).

A fine series of each form, coll. Pryer.

After carefully comparing the types in the National Collection with my own specimens, I am of opinion that *P. serena*, Butl., is only a slight modification of *P. jessica*.

Yokohama (*Jonas* and *Pryer*); Tokio (*Fenton*).

268. PLUSIA NIGRISIGNA.

Plusia nigrisigna, Walk. Cat. Lep. Het. xii. p. 928 (1857).

Six specimens of this species in Pryer's collection under the name of *P. gamma*, which it certainly closely resembles, but is nevertheless a good species.

Yokohama (*Pryer*); N. India.

269. PLUSIA ORNATISSIMA.

Plusia ornatissima, Walk. Cat. Lep. Het. xv. p. 1786 (1858).
Plusia locuples, Oberth. Etud. d'Ent. v. p. 85, pl. ix. fig. 3 (1880).

Three examples, coll. Pryer (nos. 909 & 914).

I have received from my native collector one specimen taken at Hakodate in June or July.

Yokohama, Nikko (*Pryer*); Hakodate (*Nat. Coll.*); Askold, N. India.

270. PLUSIA RUTILIFRONS.

Plusia rutilifrons, Walk. Cat. Lep. Het. xv. p. 1785 (1858).

Several specimens, coll. Pryer.

Varies considerably in depth of colour.

Yokohama (*Pryer*); Hakodate, Nikko (*Nat. Coll.*); N. China.

271. PLUSIA PYROPIA.

Plusia pyropia, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 267 (1878).

Four specimens, coll. Pryer.

My native collector took one example at Gensan in July.

Oiwake (*Pryer*); Gensan (*Nat. Coll.*)

272. PLUSIA PURISSIMA.

Plusia purissima, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 202 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 11 (1878).

Several specimens, coll. Pryer.

I took an example at Nagasaki in May and one at Gensan in July.

Tokio (*Fenton*); Yokohama (*Pryer*); Nagasaki, Gensan (*Leech*).

273. PLUSIA OCHRATA.

Plusia ochrata, Walk. Cat. Lep. Het. Suppl. iii. p. 839 (1865).

One example coll. Pryer, and one from my native collector, who took it at Gensan.

Yokohama (*Pryer*); Gensan (*Nat. Coll.*); Ceylon.

274. PLUSIA NI.

Noctua ni, Hübn. Noct. pl. 58. fig. 284.
Plusia ni, Treit. Schmett. v. p. 189; Guen. Noct. ii. p. 349.

One example, coll. Pryer.

Yokohama? (*Pryer*); Europe, New York.

275. PLUSIA CHEIRANTHI.

Plusia cheiranthi, Tausch. Mém. Mosc. 1809, p. 322, t. ii. fig. 6.
Plusia eugenia, Eversm. Bull. Nat. Mosc. 1841, i. p. 32, t. 3. fig. 3, 4; Guen. Noct. ii. p. 329.

Var. *Plusidia abrostoloides*, Butl. Ill. Typ. Lep. Het. iii. p. 28, pl. xlvii. fig. 5 (1879).

Two examples, coll. Pryer.

Oiwake (*Pryer*); Europe, South Ural, Amur.

276. DEVA SPLENDIDA.

Deva splendida, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 203 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 8 (1879).

Seven specimens, coll. Pryer.

Hakodate (*Whitely*); Yesso, Nikko (*Pryer*).

277. DIASTEMA VIRGO.

Plusia virgo, Treit. Schmett. x. 2. p. 130; Herr.-Schäff. Schmett. Eur. ii. pl. 49. figs. 248, 249.

Diastema virgo, Guen. Noct. p. 317.

? *Placodes spencei*, Boisd. Ind. Méth. p. 129; Guen. Noct. ii. p. 316.

A few specimens, coll. Pryer.

I took examples at Gensan in June and July, and these are darker than the Japanese specimens.

Yokohama, Yesso (*Pryer*); Gensan (*Leech*).

278. PLACODES AMETHYSTINA.

Noctua amethystina, Hübn. Noct. figs. 597, 598.

Plusia amethystina, Treit. Schmett. v. 3. p. 136.

Placodes amethystina, Boisd. Ind. Méth. p. 129. 1036; Guen. Noct. p. 316.

I took examples at Hakodate and Gensan in June and July.

Hakodate, Gensan (*Leech*); Tokio; Europe.

279. HABROSTOLA TRANSFIXA.

Abrostola transfixa, Walk. Cat. Lep. Het. xii. p. 884 (1857).

Several specimens, coll. Pryer.

I took an example at Gensan in July, and my native collector took one at Hakodate.

The whitish oblique streak of primaries is subject to some variation, being in some specimens well defined, whilst in others it is inconspicuous. Walker's type is from Natal.

Yokohama (*Pryer*); Gensan (*Leech*); Hakodate; Ichang; Natal.

280. HABROSTOLA TRIPLASIA.

Phal.-Noctua triplasia, Linn. Syst. Nat. x. p. 517.

Noctua triplasia, Esp. Schmett. iv. pl. 169. figs. 1–3; Hübn. Noct. fig. 626.

Abrostola triplasia, Treit. Schmett. v. 3. 138; Guen. Noct. ii. p. 323.

Four specimens, coll. Pryer.

As this species is only separable from *H. asclepiades* in the larva stage, and as I have only seen the perfect insect from Japan, I am unable to say positively that the specimens determined as *H. triplasia* are really referable to that species.

Yokohama, Oiwake (*Pryer*); Europe.

281. Habrostola urentis.

Abrostola urentis, Guen. Noct. ii. p. 322 (1852); Walk. Cat. Lep. Het. xii. p. 882 (1857).

Inguridia abrostolina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 354.

Several specimens, coll. Pryer.

I took one example in Satsuma in May.

Yokohama, Oiwake (*Pryer*); Satsuma (*Leech*); N. America.

282. Leptina grata.

Leptina grata, Butl. Trans. Ent. Soc. 1881, p. 172.

A fine series, coll. Pryer.

I took one example at Gensan in July.

Tokio (*Fenton*); Oiwake (*Pryer*); Gensan (*Leech*).

283. Micardia argentata.

Micardia argentata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 81 (1878); Ill. Typ. Lep. Het. ii. pl. xxviii. fig. 3 (1878).

Two specimens, coll. Pryer.

I have received several specimens of this species from Mr. Manley, and my native collector met with it at Nikko and Gensan in July.

Yokohama (*Jonas*, *Manley*, and *Pryer*); Gensan (*Nat. Coll.*)

284. Micardia pulchra.

Micardia pulchra, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 81 (1878); Ill. Typ. Lep. Het. pl. xxviii. fig. 4 (1878).

I received three examples from Mr. Manley, and my native collector took two specimens at Gensan in July.

Note.—Mr. Pryer says in his 'Catalogue,' p. 84: "Mr. Butler places *Micardia argentata* and *M. pulchra* among the Leucaniidæ. They are both Pyrales."

Yokohama (*Jonas* and *Manley*); Gensan (*Nat. Coll.*)

285. Plusiodonta auripicta.

Plusiodonta auripicta, Moore, Descr. Ind. Lep. Atk. ii. p. 150 (1882).

Four examples, coll. Pryer.

Loochoo (*Pryer*); Sikkim; Cherrapunji.

286. Platydia casta.

Platydia casta, Butl. Ill. Typ. Lep. Het. ii. p. 54, pl. xxxviii. fig. 1 (1878).

I took specimens at Ningpo in April, Fushiki and Gensan in July. My native collector met with it at Gensan in August, and I have received specimens from Mr. Manley of Yokohama.

This insect is probably a form of *P. compressipalpis*, Guen.

Yokohama (*Jonas*); Fushiki, Ningpo, Gensan (*Leech*).

287. Penicillaria guyra.

Eurhipia guyra, Feld. Reis. Nov. pl. cx. fig. 23.

Several examples, coll. Pryer.

I took specimens at Ningpo in April and Mr. Andrews at Hakodate in July.

Oiwake (*Pryer*); Ningpo (*Leech*); Hakodate (*Andrews*); Nikko, Tokio, Kiukiang.

288. Penicillaria costalis.

Penicillaria costalis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 367 (1879).

One example, coll. Pryer.

Yokohama? (*Pryer*).

289. Callopistria purpureofasciata.

Noctua purpureofasciata, Piller, Iter per Poseg. t. 6. 2 (1783).
Noctua logopus, Esp. Schmett. iv. pl. 125. fig. 7 (1788).
Noctua formosa, Borkh. Eur. Schmett. iv. p. 362 (1792).
Noctua pteridia, Fabr. Ent. Syst. iii. 2. 90 (1794).
Pyralis formosissimalis, Hübn. Pyral. pl. 17. fig. iii. (1789?).
Callopistria pteridis, Hübn. Verz. Schmett.
Eriopus pteridis, Treit. Schmett. v. 1. p. 366; Guen. Noct. ii. p. 293.
Callopistria obscura, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 200 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 3 (1879).

Several specimens, coll. Pryer (no. 862).

I took examples in Satsuma in May and at Nagasaki and Fusan in June; my native collector met with some at Gensan and Nikko in August, and at Ningpo in June.

Hakodate (*Whitely*); Yokohama (*Pryer*); Nagasaki, Fusan, Satsuma (*Leech*); Gensan and Ningpo (*Nat. Coll.*); Kiukiang (*Pratt*); Europe.

290. Callopistria exotica.

Eriopus exotica, Guen. Noct. ii. p. 194 (1852).
Callopistria duplicans, Walk. Cat. Lep. Het. xii. p. 866 (1857).

There were some specimens in Mr. Pryer's collection, but these were unnamed.

I took examples of this species, which is a most variable one, in Satsuma in May, and my native collector obtained specimens at Ningpo and Gensan in August.

Yokohama (*Pryer*); Satsuma (*Leech*); Gensan and Ningpo (*Nat. Coll.*); Kiukiang (*Pratt*); N. India, Java.

291. Callopistria æthiops.

Callopistria æthiops, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 206 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 4 (1879).

One example, coll. Pryer.

My collector took examples at Gensan in August, and Mr. Smith at Hakone in the same month.

Nikko (*Pryer*); Yokohama (*Jonas*, *Pryer*); Hakone (*Smith*); Gensan (*Nat. Coll.*).

292. Callopistria repleta.

Callopistria repleta, Walk. Cat. Lep. Het. xii. p. 865 (1857).

Two specimens, coll. Pryer.

I took one example at Gensan in June.

Yokohama? (*Pryer*); Gensan (*Leech*); N. India.

293. Callopistria rivularis.

Callopistria rivularis, Walk. Cat. Lep. Het. xii. p. 867 (1857).

Three specimens, coll. Pryer.

Yokohama? (*Pryer*); N. India.

294. Xylina ingrica.

Xylina ingrica, Herr.-Schäff. Eur. Schmett. ii. p. 305, pl. 99, fig. 507 (1850); Guen. Noct. ii. p. 118 (1852).

Var. *Agrotis ustulata*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 162; Ill. Typ. Lep. Het. ii. pl. xxix. fig. 10 (1878).

A fine series, coll. Pryer.

A. ustulata, Butl., is certainly a form of *X. ingrica*, H.-S., and both are probably referable to *X. furcifera*, Hufn.

Yokohama (*Pryer*); Europe.

295. Xylina ornithopus.

Noctua ornitopus, Rott. Naturf. ix. p. 124 (1776).

Noctua rhizolitha, Fabr. Mant. p. 182 (1787); Esp. Schmett. iv. pl. 121. fig. 6; Hübn. Noct. fig. 242.

Xylina rhizolitha, Treit. Schmett. v. 3. 21; Guen. Noct. ii. p. 119.

Xylina pruinosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 197 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 6.

A number of specimens, coll. Pryer.

Yokohama (*Jonas*, *Pryer*, and *Leech*); Europe.

296. Xylina saxea, sp. n. (Plate L. fig. 10.)

Primaries pale grey; the nervures are dashed with black, and there is a black streak at inner angle; three oblique black costal dashes precede small brownish clouds, there are two other larger brownish clouds, one of which is on middle of inner margin, and the other above the streak at inner angle; a small triangular brownish patch on middle of outer margin is preceded by a short black longitudinal dash: secondaries brown. Under surface brown tinged with pink, central dark spot and faint transverse line on each wing. Thorax grey; patagia edged with black; abdomen darker than secondaries, and tinged with reddish.

Expanse 41 millim.

One example, coll. Pryer.

Yokohama? (*Pryer*).

297. LITHOPHANE SAGA.

Lithophane saga, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 198 (1878); Ill. Typ. Lep. Het. iii. pl. xlv. fig. 9 (1879).

Six specimens, coll. Pryer. Mr. Manley sent me one example from Yokohama.

Yokohama (*Jonas*, *Pryer*, *Manley*).

298. PIADA MULTIPLICANS, Walk. (Plate LII. fig. 6.)

Var. JAPONICA, var. n.

Primaries greenish grey, suffused over the inner half of the wing with purplish brown; a black spot at the base on subcostal nervure; several pale transverse lines traverse the wing, the inner and outer of these are bordered with black; reniform and orbicular outlined in black, the former with a black central lunule; beyond the outer line is a series of white dots, each placed on a nervule and followed by a blue-black interrupted streak, its lower portion edged externally with orange, and the upper portion bordered by purplish-brown dots; a series of black dots on upper half of outer margin: secondaries fuscous: central and submarginal lines darker, the latter is only distinct towards anal angle, where it is edged externally with orange. Under surface ashy grey; primaries have a broad central transverse fuscous shade intersected by a darker transverse line, lunule surrounded with paler; central spot of secondaries is black, and enclosed in a yellowish ring; central line and a broad band fuscous, the latter limited by black spots, and edged externally with yellowish, a series of black lunules on outer margin.

Expanse 42 millim.

One ♂ example, coll. Pryer.

I took a ♀ specimen at Sendai in September 1886.

Yesso (*Pryer*); Sendai (*Leech*).

299. CUCULLIA FRATERNA.

Cucullia fraterna, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 198 (1879); Ill. Typ. Lep. Het. iii. pl. xlv. fig. 10 (1879).

Three specimens, coll. Pryer.

Hakodate (*Whitely*); Yokohama (*Pryer*).

300. CUCULLIA ASTERIS.

Noctua asteris, Schifferm. Wien. Verz. p. 312; Esp. Schmett. iv. pl. 154. figs. 2, 3; Hübn. Noct. fig. 260.

Cucullia asteris, Treit. Schmett. v. 3. 118; Guen. Noct. ii. p. 133.

Two specimens, coll. Pryer.

Yokohama? (*Pryer*).

301. CUCULLIA PERFORATA.

Cucullia perforata, Brem. Bull. de l'Acad. 1861, t. iii.; Lep. Ost-Sib. p. 54, pl. v. fig. 14 (1864); Oberth. Etud. d'Ent. x. pl. iii. fig. 1 (1884).

One example, coll. Pryer.

I took a specimen at Hakodate in August; this is smaller and darker than Pryer's, which was taken in Yesso. My native collector obtained one example at Gensan in July.

Yesso (*Pryer*); Hakodate (*Leech*); Gensan (*Nat. Coll.*); Sidemi (*Jankowski*); Ussuri (*Maack*).

302. CALOCAMPA FORMOSA.

Calocampa formosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 196 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 9 (1878).

Several specimens, coll. Pryer.

Yokohama (*Pryer*, *Jonas*, and *Manley*); Tokio.

303. CALOCAMPA EXOLETA.

Phal.-Noctua exoleta, Linn. Syst. Nat. x. p. 515; Faun. Suec. p. 315.

Noctua exoleta, Esp. Schmett. iv. pl. 138. figs. 1, 2; Hübn. Noct. pl. 50. fig. 244.

Xylina exoleta, Treit. Schmett. v. 3. 7.

Calocampa exoleta, Steph. Ill. Brit. Ent., Haust. ii. p. 173; Guen. Noct. ii. p. 116.

Var. *Calocampa fumosa*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 196 (1878); Ill. Typ. Lep. Het. ii. pl. xxxi. fig. 8 (1878).

Several examples, coll. Pryer.

The thorax and base of primaries are rather darker in colour, but Japanese specimens do not otherwise differ from European *C. exoleta*.

Yokohama (*Jonas* and *Pryer*); Europe.

304. AMPHIPYRA PYRAMIDEA.

Phal.-Noctua pyramidea, Linn. Syst. Nat. x. p. 518.

Noctua pyramidea, Esp. Schmett. iv. pl. 171. figs. 1–3; Hübn. Noct. fig. 36.

Amphipyra pyramidea, Treit. Schmett. v. 1. 285; Guen. Noct. ii. p. 213.

Amphipyra monolitha, Guen. Noct. ii. p. 414 (1852).

Amphipyra magna, Walk. Cat. Lep. Het. Suppl. iii. p. 868 (1865).

Amphipyra surnia, Feld. Reis. Nov. pl. cxii. fig. 17.

Amphipyra pyramidea, var. *obscura*, Oberth. Etud. d'Ent. v. p. 85.

A nice series, coll Pryer.

I took specimens at Gensan and several places in Japan in July, August, and October.

In the series before me, which is an extensive and most varied one, there are typical examples of *A. pyramidea* and forms agreeing with both *A. monolitha* and *A. magna* and other forms which link these together. There is also one example of Oberthür's var. *obscura*.

Yokohama (*Pryer*, *Manley*, *Leech*); Oiwake (*Pryer*, *Leech*); Tsuruga, Hakodate, Fushiki, Nemoro, Nagasaki, Gensan (*Leech*); Hakone (*Smith*); Kiukiang (*Pratt*); Tokio, Askold; N. India; urope.

305. Amphipyra schrenkii.

Amphipyra schrenkii, Mén. Bull. de l'Acad. xvii. p. 249; Schr. Reise Amur. ii. Lep. p. 61, pl. v. fig. 4.

Several specimens, coll. Pryer (unnamed).

I took this species at Hakodate in August.

Oiwake, Yesso (*Pryer*); Hakodate (*Leech*); Amur.

306. Amphipyra perflua.

Noctua perflua, Fabr. Mant. Ins. ii. p. 179; Hübn. Noct. fig. 35.

Noctua pyramidina, Esp. Schmett. iv. pl. 192. fig. 2.

Amphipyra perflua, Ochs. Eur. Schmett. iv. p. 70; Treit. Schmett. v. 1. 289; Guen. Noct. ii. p. 414.

Var. *Amphipyra erebina*, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 287 (1878); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 12 (1879).

Var. *Amphipyra jankowskii*, Oberth. Etud. d'Ent. x. p. 27, pl. ii. fig. 8 (1884).

Several specimens, coll. Pryer.

A. erebina, Butl., is a small form of *A. perflua*, and *A. jankowskii* has the central third of the primaries darker than in the type. I took the *erebina* form at Fushiki, Nagahama, and Gensan in July 1884, and my native collector one of the *jankowskii* form at Gensan in July 1887.

Yokohama (*Jonas* and *Pryer*); Hakodate (*Whitely*); Fushiki, Nagahama, Gensan (*Leech*); Tokio; Sidemi (*Janskowski*); Europe.

307. Amphipyra tripartita.

Amphipyra tripartita, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 288 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 4 (1878).

One example, coll. Pryer.

I took two specimens at Oiwake in October.

Yoshino (*Pryer*); Yokohama (*Jonas*); Oiwake (*Leech*); Ichang.

308. Amphipyra corvina.

Amphipyra corvina, Motsch. Bull. Soc. Nat. Mosc. xxxix. p. 194 (1866).

Several specimens, coll. Pryer.

I took this species at Nagahama and Gensan in July, and at Hakodate in August. It was a perfect pest at sugared tree-trunks and appeared to be the commonest Moth in Japan.

Yokohama, Oiwake (*Pryer*); Hakodate, Nagahama, Gensan (*Leech*); Kiukiang (*Pratt*); Amur.

309. Amphipyra livida.

Noctua livida, Fabr. Mant. Ins. ii. p. 138 (1787); Hübn. Noct. fig. 38.

Noctua scotophila, Esp. Schmett. iv. pl. 170. fig. 3.

Amphipyra livida, Treit. Schmett. v. 1. 281; Guen. Noct. ii. p. 415.

I took one specimen at Nemoro in August.

Nemoro (*Leech*); Amur; Europe.

310. PERINÆNIA LIGNOSA.

Perinænia lignosa, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 289 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 7 (1878).

Several specimens, coll. Pryer.

I took one specimen at Yokohama in October.

Yokohama (*Pryer*, *Manley*, *Jonas*, and *Leech*); Gifu (*Pryer*).

311. DINUMMA BIPUNCTATA.

Dinumma bipunctata, Motsch. Etud. d'Ent. 1860, p. 32.

Amphipyra largeteaui, Oberth. Etud. d'Ent. x. p. 28, pl. ii. fig. 7 (1884).

Several specimens, coll. Pryer.

I took examples of this species at most places visited in Japan during June and July 1886.

Yokohama (*Pryer* and *Manley*); Nagahama, Shimonoseki, Nagasaki, Tsuruga, Fushiki, Gensan (*Leech*); Kouy-Tchéou (*Largeteau*); Chekiang; Tokio.

312. AUTOPHILA DILUCIDA.

Noctua dilucida, Hübn. Noct. pl. 82. fig. 383, pl. 121. fig 558.

Autophila dilucida, Hübn. Verz. Schmett. p. 274. n. 2702; Walk. Cat. Lep. Het. xiii. p. 1026.

Agrotis dilucida, Treit. Schmett. v. 1. 198.

Spintherops dilucida, Boisd. Icones, pl. 80. fig. 5; Ind. Meth. p. 98. 742; Guen. Noct. ii. p. 423.

Appopestes inconspicua, Butl. Trans. Ent. Soc. 1889, p. 191.

Two examples, coll. Pryer.

Mr. Butler says of his *A. inconspicua*: "Most like *A. phantasma*, but not much larger than *Autophila dilucida* of Europe . . . . The specimen received from Mr. Pryer is rather darker than those from Tokio, and has blackish spots on the discocellular below."

Except that the coloration is a shade darker, my Japanese examples are exactly identical with *A. dilucida*.

Tokio (*Fenton*); Yokohama (*Pryer*); Europe.

313. ORTHOGONIA SERA.

Orthogonia sera, Feld. Wien. ent. Mon. vi. p. 38.

Orthogonia crispina, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 288 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 6 (1878).

Several specimens, coll. Pryer.

Varies considerably in tone of colour and definition of markings. Occurs abundantly at sugared trees from July to October.

Yokohama (*Pryer*, *Jonas*); Oiwake, Shimonoseki, Gensan (*Leech*); Yesso (*Pryer*); Kiukiang (*Pratt*); Tokio, Ningpo, Chekiang.

314. MORMO MUSCIVIRENS.

Mormo muscivirens, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 289 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 5 (1878).

A few specimens, coll. Pryer.

I took specimens at Gensan in July.

Yokohama (*Jonas* and *Pryer*); Nikko, Tsuruga; Kiukiang (*Pratt*).

315. NÆNIA CONTAMINATA.

Graphiphora contaminata, Walk. Cat. Lep. Het. Suppl. iii. p. 710 (1865).

Several specimens, coll. Pryer.

I took specimens at Gensan in June, and have received others from Kiukiang, China.

Yokohama, Oiwake (*Pryer*); Gensan (*Leech*); Kiukiang (*Pratt*).

316. ELIOCHRŒA SENEX.

Dandaca senex, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 82 (1878); Ill. Typ. Lep. Het. iii. pl. xliv. fig. 6 (1879).

Dandaca ? megei, Oberth. Etud. d'Ent. vi. p. 20, pl. ix. fig. 6 (1881).

A fine and extensive series, coll. Pryer.

This species varies greatly in tone of colour and intensity of markings.

I took specimens in Satsuma in May, at Nagahama in July, and my native collector obtained others at Gensan in August.

Yokohama (*Jonas* and *Pryer*); Satsuma, Nagahama (*Leech*); Gensan (*Nat. Coll.*); Kuy-Tchéou (*Largeteau*).

317. SYPNA PICTA.

Sypna picta, Butl. Cist. Ent. ii. p. 244 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 2 (1878).

Sypna achatina, Butl. *l. c.* p. 245; Ill. Typ. Lep. Het. iii. pl. xlvii. fig. 7 (1879).

Sypna fumosana, Butl. *l. c.*; Ill. Typ. Lep. Het. ii. pl. xxx. fig. 3 (1878).

Sypna fuliginosa, Butl. *l. c.*; Ill. Typ. Lep. Het. iii. pl. xlvii. fig. 8 (1879).

Sypna moorei, Butl. Trans. Ent. Soc. 1881, p. 209.

A fine and variable series, coll. Pryer.

I took specimens in Satsuma in May, and at Gensan and Shimonoseki in July, and Hakodate in August. The series in Mr. Pryer's collection comprises examples of all the forms named by Mr. Butler, others connecting these named forms, and others again which are as distinct from both of those forms as from the type.

Hakodate (*Whitely*); Yokohama (*Jonas* and *Pryer*); Nikko (*Maries*); Tokio (*Fenton*); Oiwake (*Pryer*); Satsuma, Shimonoseki, Gensan (*Leech*); Shillong, Assam.

318. SYPNA ASTRIGERA.

Sypna astrigera, Butl. Cist. Ent. iii. p. 135 (1885).

Several specimens, coll. Pryer.

I took an example at Nagasaki in June, and one at Shimonoseki in July.

Nikko, Chiuzenji (*Lewis*); Nagasaki, Shimonoseki (*Leech*); Yokohama? (*Pryer*).

319. SYPNA HERCULES.

Gisira hercules, Butl. Trans. Ent. Soc. 1881, p. 579.

One example, coll. Pryer.

I took a specimen at Hakodate in August.

Mr. Butler has placed this undoubted *Sypna* among the Hypenidæ.

320. ERYGIA APICALIS.

Erygia apicalis, Guen. Noct. iii. p. 50 (1852).
Calicula exempta, Walk. Cat. Lep. Het. xv. p. 1808 (1858).
Calicula squamiplena, Walk. *l. c.*
Dianthæcia geometroides, Walk. *l. c.* Suppl. iii. p. 722 (1865).

Six specimens, coll. Pryer.

My native collector took one example at Gensan in August.

Japan? (*Pryer*); Gensan (*Nat. Coll.*); India, Moreton Bay, Swan River.

321. TOXOCAMPA MAXIMA.

Toxocampa maxima, Brem. Lep. Ost-Sib. pl. v. fig. 17 (1864).
Toxocampa enormis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 290 (1878); Ill. Typ. Lep. Het. ii. pl. xxxii. fig. 9 (1878).

Several specimens, coll. Pryer.

I took specimens at Shimonoseki and Gensan in July.

Varies in colour from ochreous grey to violet-grey.

Yokohama (*Jonas*, *Pryer*, and *Manley*); Oiwake (*Pryer* Shimonoseki, Gensan (*Leech*); Nikko, Tokio, Amurland.

322. TOXOCAMPA VULCANEA.

Toxocampa vulcanea, Butl. Trans. Ent. Soc. 1881, p. 192.

One example, coll. Pryer.

Tokio (*Fenton*); Asamayama (*Pryer*).

323. TOXOCAMPA RECTA.

Toxocampa recta, Brem. Lep. Ost-Sib. p. 98, pl. viii. fig. 9 (1864).
Toxocampa lilacina, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 289 (1879); Ill. Typ. Lep. Het. pl. xxxii. fig. 8 (1878).

A fine series, coll. Pryer.

I took specimens at Fushiki and Nagahama in July, Sendai and Nikko in September, and at Yokohama in October. My native collector obtained others at Gensan in August.

Yokohama (*Jonas*, *Pryer*, and *Leech*); Oiwake (*Pryer*); Sendai, Nikko, Fushiki, Nagahama (*Leech*); Gensan (*Nat. Coll.*); Kiukiang (*Pratt*); Tokio, Amur.

324. Toxocampa limosa.

Ophiusa limosa, Treit. Schmett. v. 3. 298.
Noctua limosa, Frey. Neue Beitr. iii. pl. 233.
Toxocampa limosa, Guen. Noct. ii. p. 428.

Four specimens, coll. Pryer.

Oiwake (*Pryer*); Amur, Europe.

325. Ophideres fullonica.

Phal.-Noctua fullonica, Linn. Syst. Nat. xii. p. 812 (1767); Clerck, Icon. pl. 48 (1759).
Phalæna pomona, Cram. Pap. Exot. i. pl. 77. fig. C (1776).
Noctua dioscoreæ, Fabr. Sp. Ins. ii. p. 212 (1781).
Ophideres fullonica, Guen. Noct. iii. p. 111.
Othreis fullonica, Moore, Trans. Zool. Soc. 1881, p. 64, pl. 12. figs. 1, 1 *a*, pl. 13. figs. 1, 1*a*.

I have four specimens of this species; one of these is of the dark form, and was taken at Gensan by Mr. Smith; a pale specimen I took myself at Gensan in July; and two others, also dark, were taken by Mr. Pratt at Kiukiang.

Gensan (*Smith, Leech*); Kiukiang (*Pratt*); India.

326. Ophideres tyrannus.

Ophideres tyrannus, Guen. Noct. iii. p. 110.
Adris tyrannus, Moore, Trans. Zool. Soc. 1881, p. 69, pl. 13. fig. 5.

Several fine examples, coll. Pryer.

The amount of green in the brown coloration of primaries is a variable quantity.

Oiwake (*Pryer*); Hakodate (*Andrews*); Kiukiang (*Pratt*); Shanghai, Sikkim, Kulu, Simla, Bombay.

327. Nyctipao crepuscularis.

Phal.-Attacus crepuscularis, Linn. Syst. Nat. xii. p. 811; Clerck, Icon. pl. 53. figs. 1, 2.
Phalæna crepuscularis, Cram. Pap. Exot. ii. pp. 98, 99, pl. clx. fig. A, ♂, pl. clx. fig. A, ♀.
Nyctipao ephesphoris, Hübn. Verz. Schmett. p. 272. n. 2765; Guen. Noct. iii. p. 183.
Nyctipao crepuscularis, Guén. Noct. iii. p. 182.
Nyctipao lætitia, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 291 (1878).

A few examples, coll. Pryer.

I took specimens in Satsuma and at Nagasaki in May, Tsuruga and Fushiki in July.

Hakodate (*Whitely*); Yokohama, Loochoo (*Pryer*); Satsuma, Nagasaki, Tsuruga, Fushiki (*Leech*); China, Bengal, N. India, Sumatra, Madagascar, Java, Amboina, America.

328. Spirama martha.

Spirama martha, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 292 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 3 (1878).

Spirama ægrota, Butl. Trans. Ent. Soc. 1881, p. 197.

A few specimens, coll. Pryer.

I took some at Nagasaki in June.

Tokio (*Fenton*); Yokohama (*Jonas*, *Manley*, *Pryer*); Nagasaki (*Leech*); Kiukiang (*Pratt*); Nikko.

329. Spirama retorta.

Phal.-Noctua retorta, Clerck, Icon. pl. 64. figs. 2, 3 (1759); Cram. Pap. Exot. ii. p. 29, pl. cxvi. fig. O, ♂ (1777); Cram. *l. c.* iii. p. 146, pl. cclxxiv. fig. A, ♀ (1780).

Noctua spiralis, Fabr. Ent. Syst. iii. 2 (1793).

Spirama suffumosa, Guen. Noct. iii. p. 195 (1852).

Spirama japonica, Guen. *l. c.*

Spirama retorta, Guen. *l. c.* p. 196.

Spirama simplicior, Butl. Trans. Ent. Soc. 1881, p. 198.

Spirama inæqualis, Butl. Ann. & Mag. Nat. Hist. (5) xi. p. 116 (1883).

Spirama jinchuena, Butl. *l. c.* p. 115.

Spirama funestris, Butl.

A fine series, coll. Pryer.

This species is common all over Japan, Corea, and N. China, and there appears to be a succession of broods. It does not seem possible to break up the series I have from various localities into species. This series is composed of individuals selected from a large number of specimens. All the forms described by Butler and Guenée as distinct species are represented, and these are so well-linked together by intermediate modifications that there is no clear line of demarcation to be drawn between them. I am therefore obliged to consider all the specimens referable to one exceedingly variable species.

Tokio (*Fenton*); Nikko (*Maries*); Yokohama (*Jonas*, *Pryer*); Tsuruga, Nagasaki, Fushiki, Nagahama, Satsuma (*Leech*); Kiukiang (*Pratt*); Corea, Chekiang, Java, Coromandel coast.

330. Calliodes rectifasciata.

Spirama rectifasciata, Mén. Cat. Mus. Petr. pl. xvii. fig. 6.

Spirama interlineata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 291 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 2 (1878).

I took specimens at Nagasaki and Shimonoseki in June, at Tsuruga and Gensan in July.

Yokohama (*Jonas* and *Manley*): Nagasaki, Shimonoseki, Tsuruga, Gensan (*Leech*).

331. Hypopyra vespertilio.

Noctua vespertilio, Fabr. Mant. Ins. ii. p. 136.

Hypopyra vespertilio, Guen. Noct. iii. p. 199.
Hypopyra dulcina, Feld.

A few specimens, coll. Pryer.

I took specimens in Satsuma and at Shimonoseki, Nagahama, and Tsuruga in July.

Yokohama (*Pryer, Manley*); Satsuma, Shimonoseki, Nagahama, Tsuruga (*Leech*); Silhet, Java.

332. OPHIUSA FALCATA.

Ophiusa falcata, Moore, Descr. Ind. Lep. Atk. ii. p. 171, pl. vi. fig. 14 (1882).

One unnamed specimen, coll. Pryer.

My native collector took a ♂ example at Ningpo in June 1886, and a ♀ specimen at Gensan in June or July 1887.

All three are identical with Kiukiang specimens.

Japan (*Pryer*); Gensan, Ningpo (*Nat. Coll.*); Kiukiang (*Pratt*); N. India.

333. OPHIUSA ALGIRA.

Phal.-Noctua algira, Linn. Syst. Nat. xii. p. 836 (1767).
Phal.-Noctua achatina, Cram. Pap. Exot. iii. p. 145, pl. 273. fig. E (1780).
Noctua algira, Esp. Schmett. iv. pl. 87. fig. 1 (1788 ?).
Noctua stuposa, Fabr. Ent. Syst. iii. 2. p. 42. 112 (1793).
Noctua triangularis, Hübn. Noct. pl. 66. fig. 323.
Ophiusa algira, Treit. Schmett. v. 3. 308; Guen. Noct. iii. p. 270.

Several specimens, coll. Pryer.

In this species the width of central white or pale grey fascia, the outline of dark fascia beyond, and the spot at apex are all subject to modification. Some of the specimens are not separable from European *O. algira*, others agree with *O. stuposa*, Fabr.

Yokohama, Loochoo (*Pryer*); Gensan (*Nat. Coll.*).

334. OPHIUSA ALGIRA, var. CURVATA, v. n. (Plate LIII. fig. 8.)

Differs from the type in the outline of basal patch and central fascia; the former has a deep indentation below the costa and then descends straight to the inner margin, while the latter has a clear curved exterior margin. The ground-colour of primaries is more deeply suffused with violet.

Three specimens, one of which is from Loochoo, coll. Pryer, and the others were taken by my native collector at Gensan in August 1887.

Although showing some points of difference, I cannot at present regard this insect as specifically distinct from *O. algira*.

335. OPHIUSA ARCTOTÆNIA.

Ophiusa arctotænia, Guen. Noct. iii. p. 272 (1852).

A fine series, coll. Pryer.

I took examples in Satsuma in May, and at Gensan in July. Varies in size, tone of ground-colour, and width of white fascia; this

last is in one specimen from Gensan very narrow and quite uniform from costa to inner margin.

Yokohama, Loochoo (*Pryer*); Satsuma, Gensan (*Leech*); Kiukiang (*Pratt*); Nikko, Silhet, Punjaub.

336. Ophiusa arcuata.

Ophiusa arcuata, Moore, Proc. Zool. Soc. 1877, p. 609.

? *Ophiusa joviana*, Guen. Noct. iii. p. 269 (1852).

I took one example at Gensan in July.

Gensan (*Leech*).

337. Ophiusa dulcis.

Ophiusa dulcis, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 293 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 5.

A few specimens, coll. Pryer.

I took a specimen at Fusan in June, and my native collector obtained examples at Gensan in July.

Yokohama (*Jonas* and *Pryer*); Oiwake (*Pryer*); Fusan (*Leech*); Gensan (*Nat. Coll.*).

338. Chrysorithrum amatum.

Catocala amata, Brem. Beitr. zur Fauna des Nördl. China's, p. 19; Lep. Ost-Sib. p. 60 (1864).

Chrysorithrum fuscum, Butl. Trans. Ent. Soc. 1881, p. 198.

Chrysorithrum rufescens, Butl. *l. c.*

A nice series, coll. Pryer.

I took specimens at Gensan, where it swarmed at sugared tree-trunks in July.

A most variable species as regards colour of primaries, which range from olive-brown (var. *fuscum*) through violet-grey (the type) to a pale pinkish brown (var. *rufescens*). The markings also vary in intensity and in tone of colour, and the width of yellow band on secondaries is subject to considerable aberration.

Yokohama (*Jonas*); Tokio (*Fenton*); Nikko, Fujisan (*Pryer*); Gensan (*Leech*); Hakodate (*Nat. Coll.*); Kiukiang (*Pratt*); Amur.

339. Chrysorithrum maximowiczi.

Bolina maximowiczi, Brem. Lep. Ost-Sib. p. 58, pl. iv. fig. 12 (1864)

Chrysorithrum sericeum, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 292 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 4 (1878).

Three specimens, coll. Pryer.

Yokohama (*Jonas*); Oiwake, Fujisan (*Pryer*).

340. Lacera procellosa.

Lacera procellosa, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 368 (1879).

Seven specimens, coll. Pryer.

Yokohama (*Pryer* and *Manley*); Nikko (*Pryer*).

341. ERCHEIA UMBROSA.

Ercheia umbrosa, Butl. Trans. Ent. Soc. 1881, p. 194.

Four examples, coll. Pryer (no. 936, ? gen. ? sp.).

Tokio (*Fenton*); Nikko, Gifu (*Pryer*).

342. COCYTODES MODESTA.

Catocala modesta, Van der Hoeven, Lep. Nouv. pl. vii. figs. 8 *a*, *b*.
Cocytodes immodesta, Guen. Noct. iii. p. 42 (1852).
Arcte senica, Feld. Reise Nov. Lep. pl. 113. fig. 2.

Several specimens, coll. Pryer.

The larva is said to resemble a brightly coloured centipede (Pryer, Cat. p. 103).

Yokohama (*Pryer*); Kiukiang (*Pratt*); Ceylon, Silhet, Sikkim, Nilgiri Hills, Solun, Java, Sumatra.

343. LAGOPTERA ELEGANS.

Ophiusa elegans, Hoeven, Lep. Nouv. pl. v. figs. 6 *a*, *b*.
Lagoptera multicolor, Guen. Noct. iii. p. 226 (1852).
Lagoptera elegans, Walk. Cat. Lep. Het. xiv. p. 1352 (1858).

A few specimens, coll. Pryer.

I took specimens at Fushiki and Gensan in July.

Yokohama (*Pryer*); Fushiki, Gensan (*Leech*); Kiukiang (*Pratt*); Java, Himalaya.

344. CATOCALA NIVEA.

Catocala nivea, Butl. Cist. Ent. ii. p. 241 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 4 (1878).

A good series in Pryer's collection.

I found the species very abundant at Nikko in September.

This insect is a conspicuous object as it rests on trunks of *Criptomeria*, whereas its colour and ornamentation would render it almost unnoticed if it rested on the young oaks, which are common in the localities where it occurs.

Oiwake, Utsunomiya (*Pryer*); Yokohama (*Jonas*); Hakodate, Nikko, Yokohama (*Leech*); Ichang (*Pratt*); Thundiani.

345. CATOCALA LARA.

Catocala lara, Brem. Bull. de l'Acad. 1861, t. iii.; Lep. Ost-Sib. pl. v. fig. 13.

A nice series, coll. Pryer.

Yesso (*Pryer*); Tokio; E. Siberia, Askold.

346. CATOCALA INTACTA, sp. n. (Plate LIII. fig. 7.)

Primaries pale grey, clouded with darker; basal line represented by a triangular black spot on costa; the basal third, which is somewhat darker than other part of wing, is limited by a dark brown oblique band extending to the middle of wing, from whence a dark angulated line descends vertically to the inner margin; outer line serrated and elbowed below costa, it has a long inward projection at

the middle, and a sharp angulation before inner margin; reniform placed in a dark brown triangle from costa; outer third dark grey, intersected by a brownish wavy submarginal line, bordered internally with pale grey: secondaries pale buff suffused with ashy black; abdominal margin, central transverse band, and outer border blackish, a patch of pale buff at outer angle. Under surface pale buff, outer border of primaries black, as also are the central band and a broad streak from its inner extremity to the base; secondaries have narrow, blackish, central and marginal bands.

Expanse 68 millim.

Allied to *C. dula*.

One specimen taken by myself at Nagahama in July 1886.

347. CATOCALA ACTÆA.

Catocala actæa, Feld. Reise Nov. pl. cxii. fig. 22.

Several examples, coll. Pryer.

Common in mainland of Japan from July to October.

Tokio, Nikko, Fushiki, Yokohama (*Leech*); Ichang, Kiukiang.

348. CATOCALA SANCTA.

Catocala sancta, Butl. Cist. Ent. iii. p. 134 (1885).

Two specimens, coll. Pryer.

Yesso (*Pryer*).

349. CATOCALA DISSIMILIS.

Catocala dissimilis, Brem. Bull. de l'Acad. 1861, t. iii.; Lep. Ost-Sib. t. iv. fig. 15 (1864).

Several examples, coll. Pryer.

I took specimens commonly at Hakodate in August.

Yesso (*Pryer*); Hakodate (*Leech*); E. Siberia, Ichang.

350. CATOCALA NUPTA.

Phal.-Noctua nupta, Linn. Syst. Nat. xii. p. 841.

Noctua nupta, Esp. Schmett. iv. pl. 97. fig. 1, 2; Hübn. Noct. pl. 69. fig. 300.

Catocala nupta, Treit. Schmett. v. 337; Guen. Noct. iii. p. 85.

One example, coll. Pryer.

This species is recorded by Oberthür from N. China and Isle of Askold, under the name of *C. nupta* var. *obscurata*.

Yesso (*Pryer*); N. China, Askold; Europe.

351. CATOCALA DULA.

Catocala dula, Brem. Bull. de l'Acad. 1861, t. iii.; Lep. Ost-Sib. t. iv. fig. 14 (1864).

Several examples, coll. Pryer.

I took a number of specimens of this species at Hakodate in August, and Sendai in September.

Yesso, Kurile Islands (*Pryer*); Hakodate, Sendai (*Leech*); E. Siberia.

352. CATOCALA ELECTA.

Noctua electa, Borkh. Eur. Schmett. iv. p. 26 (1792); Hübn. Noct. fig. 331.

Catocala electa, Treit. Schmett. v. p. 355; Guen. Noct. iii p. 87.

Catocala zalmunna, Butl. Cist. Ent. iii. p. 241 (1877); Ill. Typ. Lep. Het. iii. pl. xlvii. fig. 3 (1879).

Several specimens, coll. Pryer.

I took examples at Gensan in July, Hakodate in August, and Sendai in September.

In size Japanese specimens range from 75 millim. to 86 millim. in expanse, giving an average of 80 millim., whilst European specimens in my collection vary from 70 millim. to 82 millim., average 77 millim. The colour of primaries varies from silvery grey through ochreous grey to dark grey (Gensan examples), and there is some modification in the width of the band of secondaries; but altogether there is really nothing to separate *C. zalmunna*, Butl., from the European *C. electa*.

Yokohama (*Jonas*); Oiwake, Yesso (*Pryer*); Hakodate, Gensan (*Leech*); Nikko, Tokio, Saporo.

353. CATOCALA VOLCANICA.

Catocala volcanica, Butl. Cist. Ent. ii. p. 244 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 10 (1878).

A fine series, coll. Pryer.

I took specimens at Fushiki in July, and Hakodate in September.

Oiwake, Yokohama (*Pryer*); Fushiki, Hakodate (*Leech*); Kiukiang.

354. CATOCALA MIRIFICA.

Catocala mirifica, Butl. Cist. Ent. ii. p. 243 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 7.

A fine series, coll. Pryer, and I received four examples from Mr. Manley.

Yokohama (*Jonas*, *Pryer*, and *Manley*).

355. CATOCALA BELLA.

Catocala bella, Butl. Cist. Ent. ii. p. 242 (1877); Ill. Typ. Lep. Het. iii. pl. xlvi. fig. 10 (1879).

Catocala serenides, Staud. Stett. ent. Zeit. 1888.

A fine series, coll. Pryer.

Yokohama (*Jonas*); Chiuzenji.

356. CATOCALA JONASII.

Catocala jonasii, Butl. Cist. Ent. ii. p. 242 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 6.

A nice series, coll. Pryer.

I took examples at Fushiki and Tsuruga in July, and Nikko in September.

Yokohama (*Jonas* and *Pryer*); Fushiki, Tsuruga, Nikko (*Leech*).

357. Catocala omphale.

Catocala omphale, Butl. Trans. Ent. Soc. 1881, p. 195.

Four specimens, coll. Pryer.

Tokio (*Fenton*); Yesso (*Pryer*).

358. Catocala hymenea.

Noctua hymenea, Schiff. S. V. p. 91; Esp. Schmett. iv. pl. 106. fig. 1; Hübn. Noct. pl. 73. fig. 340.

Noctua posthuma, Hübn. Noct. pl. 113. figs. 526, 527.

Catocala hymenea, Treit. Schmett. v. p. 373; Guen. Noct. iii. p. 105.

I took two examples at Gensan in July.

Gensan (*Leech*); South and East Europe.

359. Catocala puella, sp. n. (Plate LIII. fig. 5.)

Primaries greyish brown; a black abbreviated basal line and indented inner line; the outer line is also black; this last starts from the costa in an oblique direction towards outer margin, then curves inwards and upwards to the median nerve, which it traverses for a short distance, then descends to the inner margin making one sharp angle in its course; a dark wavy submarginal line and a series of dark marginal lunules; stigmata indistinct: secondaries pale yellowish orange, with broad blackish outer margin and a dash of the ground-colour at outer angle; central band interrupted before the costa. Under surface pale yellowish orange; blackish central line and outer border to all the wings; the outer angle of secondaries is tipped with orange. Abdomen grey, tinged with tawny beneath.

Expanse 50 millim.

One example taken by myself at Gensan in July 1886.

360. Catocala esther.

Catocala esther, Butl. Cist. Ent. ii. p. 243 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 9 (1878).

Several examples, coll. Pryer.

I took specimens at various localities in Japan and at Gensan in the Corea in July.

Yokohama (*Jonas* and *Pryer*); Shimonoseki, Tsuruga, Nagahama, Gensan (*Leech*); Tokio, Chekiang, Kiukiang.

361. Catocala ella.

Catocala ella, Butl. Cist. Ent. ii. p. 242 (1887); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 5 (1878).

A fine series, coll. Pryer.

I took a fine series at Hakodate in August.

The black bands of secondaries are subject to considerable variation; in some examples almost the entire wing is suffused with black.

Yokohama (*Jonas*, *Manley*, and *Pryer*); Yesso (*Pryer*); Hakodate (*Leech*).

362. Catocala separans, sp. n. (Plate LIII. fig. 6.)

Allied to *C. duplicata*, but the black outer line is more strongly angulated and produced below the costa, and the tooth-like projection above the inner margin is of greater length. There is also a conspicuous white spot outlined in black below the reniform. On the secondaries the central black transverse band is curved instead of angulated, and is interrupted before reaching the external margin; the black marginal border is scalloped on its internal edge. Antennæ two thirds the length of primaries.

Expanse 57 millim.

I took a specimen at Nagahama and one at Fushiki in July.

363. Catocala duplicata.

Catocala duplicata, Butl. Cist. Ent. iii. p. 135 (1885).

One example, coll. Pryer, without exact locality.

364. Catocala prægnax.

Catocala prægnax, Walk. Cat. Lep. Het. xiii. p. 1213 (1857); Butl. Ill. Typ. Lep. Het. pl. xlvi. fig. 11 (1879).

I took two examples at Gensan in July.

North China (*Fortune*); Gensan (*Leech*).

365. Catocala connexa.

Catocala connexa, Butl. Trans. Ent. Soc. 1881, p. 196. no. 84.

Catocala nubila, Butl. *l. c.* no. 85.

Several specimens, coll. Pryer.

I took examples commonly at Hakodate in August and a few Sendai in September. The specimens vary in coloration of primaries from pale silvery grey, through ochreous grey with well-defined transverse lines and markings, to an almost unicolorous dark ashy grey. In one ochreous-grey example from Hakodate the space between the central transverse lines is filled up with blackish forming a broad fascia.

Tokio (*Fenton*); Oiwake (*Pryer*); Hakodate, Sendai (*Leech*).

366. Catocala paranympha.

Phal.-Noctua paranympha, Linn. Syst. Nat. xii. p. 842.

Catocala xarippe, Butl. Cist. Ent. ii. p. 243 (1877); Ill. Typ. Lep. Het. ii. pl. xxxiii. fig. 8.

Several examples, coll. Pryer, unnamed.

I took specimens at Tsuruga, Nagahama, Sendai, Yokohama, and Gensan. Japanese specimens are larger than examples from Europe, but do not differ in any other particular.

Hakodate (*Whitely*).

367. Remigia archesia.

Phal.-Noctua archesia, Cram. Pap. Exot. iii. p. 145, pl. cclxxiii. figs. F, G.

Phal.-Noctua virbia, Cram. *l. c.* p. 146, fig. H.
Remigia archesia, Guen. Noct. p. 318.

A nice series, coll. Pryer.

I took examples at Foochau in April, and Mr. Smith met with it at Hakone in August. My native collector also obtained it at Ningpo in June and Gensan in July.

Yokohama (*Pryer*); Foochau (*Leech*); Hakone (*Smith*); Ningpo, Gensan (*Nat. Coll.*); Punjaub, N. India, Ceylon, Java, Sierra Leone, N. China.

368. REMIGIA ANNETTA.

Remigia annetta, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 293 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 7.

Several specimens, coll. Pryer.

I took examples at Ningpo in April in Satsuma, and at Nagasaki in May, and at Tsuruga, Fushiki, and Gensan in July.

Yokohama (*Jonas* and *Pryer*); Hakodate (*Whitely*); Satsuma, Nagasaki, Tsuruga, Fushiki, Gensan, Ningpo (*Leech*); Formosa, N. India.

369. REMIGIA NIGRISIGNA, sp. n. (Plate LII. fig. 5.)

Primaries greyish brown, faintly tinged with pinkish; basal line represented by a spot on costa and one below it; inner line dark brown, preceded by a black spot above inner margin; central line wavy and indistinct; outer line curves from costa and skirting the indented external edge of a dark patch following the reniform continues a wavy course to the 1st median nervule, when it curves inwards and upwards to the 2nd median, then recurves to a point further inwards on the 1st median; from thence it descends in a graceful sweep to the inner margin; submarginal pale, denticulated, shaded on each side with darker: secondaries grey-brown, central transverse line and marginal border darker, the latter intersected by a line of the ground-colour. Under surface grey; basal half of primaries suffused with fuscous; central line, spot, and a broad border on outer margin fuscous, the latter intersected by a transverse band of ground-colour.

Expanse 40 millim.

One specimen taken by myself in Satsuma, May 1886.

There is an unnamed example of this species from Formosa in coll. Moore.

370. AZAZIA USSURIENSIS.

Remigia ussuriensis, Brem. Lep. Ost-Sib. p. 61, pl. v. fig. 19 (1864).

Azazia unduligera, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 293 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 8 (1878).

A few specimens, coll. Pryer.

Mr. Pryer in his 'Catalogue of the Lepidoptera of Japan,' p. 103, says:—"*Azazia unduligera* I believe to be a *Pyralis*."

I took examples at Nagasaki in June; at Shimonoseki, Fushiki, Tsuruga in July, and at Hakodate and Hakone in August.

Yokohama (*Pryer* and *Jonas*); Nagasaki, Shimonoseki, Fushiki, Tsuruga, Hakodate, Hakone (*Leech*); Tokio, Ussuri.

371. EUCLIDIA GLYPHICA.

Phal.-Noctua glyphica, Linn. Syst. Nat. x. p. 510; Faun. Suec. p. 1161.

Noctua glyphica, Esp. Schmett. iv. pl. 89. fig. 2; Hübn. Noct. fig. 347.

Euclidia glyphica, Treit. Schmett. v. 3. 390; Guen. Noct. iii. p. 293.

Euclidia consors, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 293 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 6 (1878).

A few specimens, coll. Pryer.

Yokohama (*Jones*); Oiwake, Yesso (*Pryer*).

372. PELAMIA ELECTARIA.

Doryodes electaria, Brem. Lep. Ost-Sib. p. 84, pl. vii. fig. 12.

Pelamia electaria, Staud. Cat. Lep. Eur. p. 135.

Five specimens, coll. Pryer.

Yesso, Oiwake, Amur.

373. ZETHES MUSCULUS.

Zethes musculus, Mén. Bull. Acad. Pét. iii. p. 110.

Several specimens, coll. Pryer.

I took examples at Gensan in July.

Yokohama, Oiwake (*Pryer*); Gensan (*Leech*); Amur.

374. PSIMADA CINERACEA.

Psimada cineracea, Butl. Ill. Typ. Lep. Het. iii. p. 27, pl. xlvii. fig. 4 (1879).

A few specimens among Mr. Pryer's duplicate Deltoids.

Yokohama (*Jones*).

375. TROTOSEMA SORDIDUM.

Trotosema sordidum, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 449 (1879).

Yokohama (*Pryer*).

376. PLATYJA NUBIFERALIS.

Platyja nubiferalis, Leech, Entom. xxii. p. 64, pl. ii. fig. 8 (1889).

I took specimens in Satsuma and at Nagasaki in June.

Satsuma, Nagasaki (*Leech*); Kiukiang (*Pratt*).

377. CAPNODES CREMATA.

Capnodes cremata, Butl. Ann. & Mag. Nat. Hist. (5) i. p. 295 (1878); Ill. Typ. Lep. Het. ii. pl. xxxiv. fig. 10 (1878).

I took specimens at Gensan in July and Hakodate in August.

Yokohama (*Jonas*); Hakodate, Gensan (*Leech*).

378. CAPNODES CINEREA.

Capnodes cinerea, Butl.

One example taken by my native collector at Hakodate in June or July 1887.

Hakodate (*Nat. Coll.*).

379. CAPNODES GENSANALIS.

Capnodes gensanalis, Leech, Entom. xxii. p. 63, pl. ii. fig. 9 (1889).

One specimen taken by myself at Gensan in July 1886.

Gensan (*Leech*).

380. CAPNODES CURVIPALPIS.

Capnodes curvipalpis, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 369 (1879).

I took examples at Tsuruga and Gensan in July.

Yokohama (*Pryer*).

381. BITHIASA NOTIGERA.

Bithiasa notigera, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 369 (1879).

Yokohama (*Pryer*).

382. MESTLETA LUTEFASCIALIS.

Mestleta lutefascialis, Leech, Entom. xxii. p. 65, pl. ii. fig. 15 (1889).

I took a male specimen in Satsuma, May 1886.

Satsuma (*Leech*).

383. MADOPA SALICALIS.

Pyralis salicalis, Fabr. Syst. Ent. iii. 369; Hübn. Pyral. fig. 3.

Madopa salicalis, Steph. Cat. Brit. Ins. ii. p. 159; Guen. Delt. p. 22.

Calobochyla salicalis, Hübn. Verz. Schmett. p. 344; Steph. Ill. Brit. Ent., Haust. iv. p. 18.

Amblygoes cinerea, Butl. Ill. Typ. Lep. Het. iii. p. 69, pl. lviii. fig. 1 (1879).

Several specimens, coll. Pryer.

I took this species in Satsuma in May, at Hakodate in August, and at Gensan in July.

Yokohama (*Jonas* and *Pryer*); Satsuma, Hakodate, Gensan (*Leech*); Europe.

384. MADOPA FLAVOMACULA.

Madopa flavomacula, Oberth. Etud. d'Ent. v. p. 87, pl. iv. fig. 5 (1880).

I took examples at Ningpo in April, in Satsuma in May, at Nagasaki and Gensan in June.

Satsuma, Nagasaki, Gensan, Ningpo (*Leech*); Askold, Amur.

385. DICHROMIA CLARIPENNIS.

Dichromia claripennis, Butl. Ill. Typ. Lep. Het. ii. p. 54, pl. xxxviii. fig. 2 (1878).

One example, coll. Pryer.

I took a specimen at Ningpo in April, and one at Gensan in July.

Yokohama (*Jonas*, ? *Pryer*); Ningpo, Gensan (*Leech*).

386. DICHROMIA AMICA.

Dichromia amica, Butl. *l. c.* p. 55, fig. 3.

I obtained specimens at Nagasaki in May, Hakodate in June, Fushiki in July, and my native collector took the species at Gensan in July.

Yokohama (*Jonas*); Hakodate (*Whitely* and *Leech*); Nagasaki, Fushiki (*Leech*); Gensan (*Nat. Coll.*).

387. HYPENA RHOMBALIS.

Hypena rhombalis, Guen. Delt. p. 33 (1854).

I took specimens at Hakodate in August and at Ningpo in April.

Hakodate, Ningpo (*Leech*); Central India.

388. HYPENA FONTIS.

Hypena fontis, Thunb. Mus. Nat. p. 72, fig. 5 (1788).
Crambus crassalis, Fabr. Ent. Syst. p. 222 (1794).
Pyralis achatalis, Hübn. Pyral. pl. 2. fig. 12, pl. 27. fig. 172.
Pyralis terriculalis, Hübn. *l. c.* pl. 25. fig. 163.
Bomolochra crassalis, Treit. Schmett. vii. p. 24; Guen. Delt. p. 33.
Hypena gilla, Butl. Ill. Typ. Lep. Het. iii. p. 60, pl. lvi. fig. 1 (1879).

A fine series taken by myself in Satsuma in May and at Gensan in June.

389. HYPENA SQUALIDA.

Hypena squalida, Butl. Ill. Typ. Lep. Het. iii. p. 60, pl. lvi. fig. 2 (1879).

Probably a form of *Bomolochra fontis*.

Yokohama (*Jonas*).

390. HYPENA ELLA.

Hypena ella, Butl. Ill. Typ. Lep. Het. ii. p. 55, pl. xxxviii. fig. 5 (1878).

I took specimens at Nagasaki in May.

Yokohama (*Jonas*); Nagasaki (*Leech*).

391. HYPENA INDICATALIS.

Hypena indicatalis, Walk. Cat. Lep. Het. xvi. p. 61 (1858).

I took specimens in Satsuma and at Nagasaki in May, and my native collector obtained the species at Gensan in July.

Nagasaki, Satsuma (*Leech*); Gensan (*Nat. Coll.*); Loochoo (*coll. Pryer*); Sarawak, Borneo.

392. Hypena rivuligera.

Hypena rivuligera, Butl. Trans. Ent. Soc. 1881, p. 579.
"Allied to Indian *H. lacessalis*, Walk."
Tokio (*Fenton*).

393. Hypena satsumalis.

Hypena satsumalis, Leech, Entom. xxii. p. 62, pl. ii. fig. 13 (1889).
I took five specimens in Satsuma, May 1886.
Satsuma (*Leech*).

394. Hypena stigiana.

Hypena stigiana, Butl. Ill. Typ. Lep. Het. ii. p. 55, pl. xxxviii. fig. 6 (1878).

Three examples, coll. Pryer.

I took specimens at Nagasaki in May, Hakodate, June, July, and August, and my native collector met with this species at Gensan in July.

Yokohama (*Jonas*); Hakodate, Nagasaki (*Leech*); Gensan (*Nat. Coll.*).

395. Hypena belinda.

Hypena belinda, Butl. Ill. Typ. Lep. Het. iii. p. 61, pl. lvi. fig. 3 (1879).

Four specimens, coll. Pryer.

I obtained examples at Fushiki in July, Nikko in September, and Oiwake in October, whilst my native collector took it at Nagasaki in June, and Gensan in July.

Yokohama (*Jonas*); Fushiki, Nikko, Oiwake (*Leech*); Nagasaki and Gensan (*Nat. Coll.*).

396. Hypena albopunctalis, sp. n. (Plate LII. fig. 10.)

♂. Primaries olive-brown with a purple tinge, strongest towards apex; central fourth dark olive-brown, bounded on its inner edge by a darker angulated and indented line, its external edge limited by a violet-grey bordered dark bisinuate line; submarginal line indicated by an irregular series of black white-edged dots, larger towards the costa, outer marginal line formed of black triangular dots placed at the extremities of the nervules; a pear-shaped white discal spot narrowly edged with blackish and a few dark dashes on the costa beyond the exterior line: secondaries fuscous brown, central spot darker. Under surface pale grey-brown; primaries clouded with ochreous on costal and outer margins; central line darker, visible on the costa only, where it is bordered externally with pale brown, beyond and nearer the apex is a round black spot; secondaries, central line black, two transverse fuscous lines, marginal line black and interrupted except at anal angle, where it is entire and distinct.

Expanse 34 millim.

One specimen taken by my native collector at Gensan in July 1886.

In structure this species agrees well with *H. mandatalis*, Walk., from Ceylon, but it differs therefrom in colour and marking, the white discal spot being a very conspicuous feature. From *H. stigiana*, Butl., which it resembles superficially, it is easily separable by the very different palpi.

397. HYPENA OBESALIS.

Pyralis crassalis, Hübn. Pyral. pl. 2. fig. 8.
Hypena obesalis, Treit. Schmett. vii. 27; Guen. Delt. p. 28.
Hypena tripunctalis, Brem. Lep. Ost-Sib. p. 62, pl. v. fig. 20 (1864).

A long and most variable series. The specimens were taken by myself in Satsuma in May and Gensan in June.

Satsuma, Gensan (*Leech*).

398. HYPENA ROSTRALIS.

Pyralis rostralis, Linn. Syst. Nat. x. p. 533; Faun. Suec. p. 350.
Pyralis rostralis, Hübn. Pyral. fig. 10, 191, 394.
Hypena rostralis, Treit. Schmett. vii. 29; Steph. Ill. Haust. iv. p. 12; Guen. Delt. p. 31.

I took one example of this species at Hakodate in August.

Hakodate (*Leech*); Europe.

399. HYPENA KENGKALIS.

Hypena kengkalis, Brem. Lep. Ost-Sib. p. 63, pl. v. fig. 21 (1864).

Several, coll. Pryer.

I took examples at Nagasaki in June, Hakodate in August, and at Oiwake in October.

Yokohama? (*Pryer*); Nagasaki, Hakodate, Oiwake (*Leech*); Amur.

400. HYPENA SIMILALIS, sp. n. (Plate LII. fig. 2.)

♂. Primaries greyish, sparingly sprinkled with blackish scales, traversed from near apex to middle of inner margin by a brownish line, which is edged externally with paler; the area within this line is tinged with ochreous, and that beyond the line with violet; orbicular stigma white, punctiform, with a few black scales on its internal edge; reniform linear, pale with a black dot at each extremity; dark but indistinct basal line runs obliquely from costa to below orbicular, where it turns sharply inwards and downwards to inner margin; submarginal line, composed of black dots, starts from apex and terminates in two large spots on the inner margin; fringes brown: secondaries pale brown, central spot darker; fringes pale at the base and preceded by a dark brown line. Under surface pale fuscous brown, central spot on primaries darker.

Expanse 38 millim.

I took three male specimens at Oiwake in October 1886, and my native collector obtained one example of the same sex at Nikko in September of the same year.

Closely allied to *H. kengkalis*, Brem., but the orbicular is white, the reniform ill defined, and the transverse line commences at the apex in *H. similalis*.

401. HYPENA VIGENS.

Hypena vigens, Butl. Ill. Typ. Lep. Het. ii. p. 55, pl. xxxviii. fig. 4 (1878).

Hypena incurvata, Moore, Descr. Ind. Lep. Atk. ii. p. 189 (1882).

Several examples, coll. Pryer, without exact locality.

A variable species allied to *H. abductalis*.

Yokohama (*Jonas* ?, *Pryer*); Khasi Hills.

402. HYPENA COLUMBARIS.

Hypena columbaris, Butl. Ill. Typ. Lep. Het. ii. p. 55, pl. xxxviii. fig. 7 (1878).

I took specimens at Fusan in June, and Gensan in July.

Yokohama (*Jonas*); Fusan, Gensan (*Leech*).

403. HYPENA MINNA.

Hypena minna, Butl. Ill. Typ. Lep. Het. iii. p. 59, pl. lv. fig. 12 (1879).

A few specimens, coll. Pryer.

My native collector took this species at Gensan in July.

Yokohama (*Jonas*); Gensan (*Nat. Coll.*); Loochoo (*Pryer*); Ichang (*Pratt*).

404. HYPENA TATORHINA.

Hypena tatorhina, Butl. Ill. Typ. Lep. Het. iii. p. 60, pl. lv. fig. 13 (1879).

Yokohama (*Jonas*); Hakodate (*Whitely*); Kulu.

Mr. Butler says, "Closely allied to *H. proboscidalis*."

405. HYPENA SUBCYANEA.

Hypena subcyanea, Butl. Proc. Zool. Soc. 1880, p. 681.

Hypena subviolacea, Butl.

Some specimens, coll. Pryer.

My native collector met with examples at Gensan in July, and I took others at Foochau in April.

Yokohama? (*Pryer*); Gensan (*Nat. Coll.*); Foochau (*Leech*); Formosa.

406. HYPENA RUSTICALIS.

Hypena rusticalis, Leech, Entom. xxii. p. 63, pl. ii. fig. 12 (1889).

One male specimen taken by myself at Hakodate, August 1886.

Hakodate (*Leech*).

407. HYPENA COREALIS.

Hypena corealis, Leech, Entom. xxii. p. 62, pl. ii. fig. 1 (1889).

Two specimens taken by myself at Gensan in July 1886.

Gensan (*Leech*).

408. NAXIA COREANA, sp. n. (Plate LII. fig. 11.)

♀. Primaries brownish grey tinged with violet, basal third dark chocolate-brown; outer line angulated, blackish, edged below the costa with grey; submarginal line pale grey, indistinct, followed by two apical blackish spots, secondaries blackish brown, with two darker pale-edged transverse lines; fringes paler at the tips. Under surface fuliginous brown; primaries with two darker pale-edged transverse bands; secondaries with a dark central line and an indistinct pale-edged submargiual line. Fringes of all the wings pale.

Expanse 32 millim.

Three specimens taken by myself at Gensan in June and July 1886.

409. GISIRA SIGNATA.

Gisira signata, Butl. Ill. Typ. Lep. Het. iii. p. 61, pl. lvi. fig. 4 (1879).

I took examples at Gensan in July.

Yokohama (*Jonas*); Gensan (*Leech*).

410. HORMISA CRAMBOIDES.

Hormisa cramboides, Butl. Ill. Typ. Lep. Het. iii. p. 62, pl. lvi. fig. 6 (1879).

Several specimens, coll. Pryer.

My native collector obtained specimens at Nagasaki in June.

Yokohama (*Jonas* and *Pryer*).

411. HORMISA MOROSA.

Hormisa morosa, Butl. Ann. & Mag. Nat. Hist. (5) iii. p. 446.

A few specimens, coll. Pryer.

I took examples at Shimonoseki in July and at Hakone in August. My native collector obtained some at Nagasaki in June.

Yokohama (*Jonas*); Shimonoseki, Hakone (*Leech*); Nagasaki (*Nat. Coll.*).

412. HORMISA CALAMINA.

Hormisa calamina, Butl. Ann. & Mag. Nat. Hist. (5) iii. p. 446.

One example, coll. Pryer.

I took a specimen at Nagasaki in June.

Yokohama? (*Pryer*); Nagasaki (*Leech*).

413. RIVULA SUBROSEA.

Rivula subrosea, Butl. Trans. Ent. Soc. 1881, p. 580.

Tokio (*Fenton*).

414. RIVULA SERICEALIS.

Pyralis sericealis, Scop. Ent. Carn. p. 242 (1763); Hübn. Pyral. fig. 56; Treit. Schmett. vii. 125.
Rivula sericealis, Dup. Lép. p. 145, pl. 219. figs. 4, 5; Guen. Delt. p. 48.

A few specimens, coll. Pryer.

I took this species at Nagasaki in May and Gensan in June.

Nagasaki, Gensan (*Leech*); Ichang and Chang Yang (*Pratt*); Europe.

415. GABALA ARGENTATA.

Gabala argentata, Butl. Ill. Typ. Lep. Het. ii. p. 56, pl. xxxix. fig. 3 (1878.)

Several, coll. Pryer.

I obtained examples in Satsuma in May, at Nagasaki in May and June, and at Fushiki in July. My native collector took some at Gensan in August.

Yokohama (*Jonas*); Satsuma, Nagasaki, Fushiki (*Leech*); Gensan (*Nat. Coll.*).

416. PECHYPOGON BARBALIS.

Phal.-Geometra barbalis, Clerck, Icones, v. fig. 3 (1759); Linn. Faun. Suec. p. 350 (1761).
Pyralis pectitalis, Hübn. Pyral. pl. 19. fig. 122.
Paracolax barbalis, Hübn. Verz. Schmett. p. 344. n. 3295.
Herminia barbalis, Treit. Schmett. vii. 5; Guen. Delt. p. 56.
Pechipogon barbalis, Steph. Ill. Brit. Haust. iv. 15.

Two specimens taken by my native collector at Hakodate in June or July.

Hakodate (*Nat. Coll.*); Europe.

417. ZANCLOGNATHA GRISEALIS.

Pyralis grisealis, Hübn. Pyral. fig. 4.
Herminia grisealis, Treit. Schmett. vii. 9; Dup. Lép. viii. p. 23, pl. 211. fig. 4; Guen. Delt. p. 59.
Phalæna nemoralis, Fabr. Ent. Syst. p. 642.
Parocolax grisealis, Hübn. Verz. Schmett. p. 244. n. 3297.
Paracolax nemoralis, Steph. Ill. Brit. Haust. p. 16.

My native collector took one example at Hakodate in July.

Hakodate (*Nat. Coll.*); Europe.

418. ZANCLOGNATHA TRILINEALIS.

Herminia trilinealis, Brem. Lep. Ost-Sib. p. 64, pl. v. fig. 2 (1864).

Several examples, coll. Pryer.

Specimens were taken by myself in Satsuma in May and at Nagasaki in June.

Satsuma, Nagasaki (*Leech*); Amur.

419. ZANCLOGNATHA TARSICRINALIS.

Herminia tarsicrinalis, Knoch, Beitr. ii. p. 75, pl. iv. figs. 1–12; Treit. Schmett. vii. 13; Guen. Delt. p. 57.

Herminia arenosa, Butl. Ill. Typ. Lep. Het. ii. p. 56, pl. xxxviii. fig. 8 (1878).

Several, coll. Pryer.

I took specimens at Nagasaki in May and Gensan in June. My native collector obtained others at Hakodate in June or July.

Yokohama (*Jonas*); Nagasaki, Gensan (*Leech*); Hakodate (*Nat. Coll.*).

420. ZANCLOGNATHA FUMOSA.

Herminia fumosa, Butl. Ill. Typ. Lep. Het. iii. p. 62, pl. lvi. fig. 8 (1879).

Zanclognatha assimilis, Staud. Stett. ent. Zeit. 1888.

Several examples, coll. Pryer.

I took specimens in Satsuma in May and at Nagasaki in June.

Yokohama (*Jonas* and *Pryer*); Satsuma, Nagasaki (*Leech*); Wladiwostok.

421. ZANCLOGNATHA TARSIPENNALIS.

Herminia tarsipennalis, Treit. Schmett. x. 35; Guen. Delt. p. 58.

Pyralis tarsicrinalis, Hübn. Pyral. fig. 5.

I took specimens in Satsuma in May, at Nagasaki and Fusan in June, and at Gensan in July.

Satsuma, Nagasaki, Fusan, Gensan (*Leech*); Amur; Europe.

422. ZANCLOGNATHA LINEALIS.

Zanclognatha linealis, Leech, Entom. xxii. p. 63, pl. ii. fig. 4 (1889).

I took a male specimen in Satsuma and a female example at Nagasaki, May 1886.

Satsuma, Nagasaki (*Leech*).

423. ZANCLOGNATHA STRAMENTACEALIS.

Herminia stramentacealis, Brem. Lep. Ost-Sib. p. 64 (*stramentalis*), pl. v. fig. 22 (1864).

Amur, Yokohama? (*Pryer*).

424. HERMINIA DERIVALIS.

Pyralis derivalis, Hübn. Pyral. pl. 3. fig. 19.

Herminia derivalis, Treit. Schmett. vii. 7; Dup. Lép. viii. pl. 218 fig. 5; Guen. Delt. p. 55.

A few, coll. Pryer.

I took several specimens at Gensan in June, and my native collector met with this species at Hakodate in June or July.

Yokohama? (*Pryer*); Hakodate (*Nat. Coll.*); Gensan (*Leech*); Chang Yang (*Pratt*); Europe.

425. HERMINIA NINGPOALIS.

Herminia ningpoalis, Leech, Entom. xxii. p. 64, pl. ii. fig. 7 (1889).

Five specimens taken in the Snowy Valley near Ningpo by my native collector, July 1886.

Ningpo (*Nat. Coll.*); Chang Yang (*Pratt*).

426. HERMINIA FASCIALIS.

Herminia fascialis, Leech, Entom. xxii. p. 64, pl. ii. fig. 3 (1889).

My native collector took one male specimen at Hakodate, July 1887.

Hakodate (*Nat. Coll.*).

427. HERMINIA ALBOMACULALIS.

Herminia albomaculalis, Brem. Lep. Ost-Sib. p. 65, pl. v. fig. 24 (1864).

I took examples at Gensan in June and July, and my native collector took others at Ningpo in the last-named month.

Gensan (*Leech*); Ningpo (*Nat. Coll.*); Ussuri.

428. HERMINIA DOLOSA.

Herminia dolosa, Butl. Ann. & Mag. Nat. Hist. (5) iii. p. 447.

I took specimens at Fushiki in July.

Fushiki (*Leech*).

429. HERMINIA GRISELDA.

Herminia griselda, Butl. Ill. Typ. Lep. Het. iii. p. 63, pl. lvi. fig. 9 (1879).

Four specimens, coll. Pryer.

Taken by myself at Hakone in August and by my native collector at Gensan in June.

Yokohama (*Jonas*); Hakone (*Leech*); Gensan (*Nat. Coll.*).

430. HERMINIA HELVA.

Herminia helva, Butl. Ann. & Mag. Nat. Hist. (5) iii. p. 447.

Several examples, coll. Pryer.

I obtained specimens in Satsuma and at Nagasaki in May, and my native collector took some at Hakodate in June or July.

Satsuma, Nagasaki (*Leech*); Hakodate (*Nat. Coll.*).

431. HERMINIA PRYERI.

Herminia pryeri, Butl. Ill. Typ. Lep. Het. iii. p. 63, pl. lvi. fig. 11 (1879).

A specimen, coll. Pryer.

I took one example of this species in Satsuma in May.

Yokohama (*Jonas*, ? *Pryer*); Satsuma (*Leech*).

432. HERMINIA FENTONI.

Herminia fentoni, Butl. Ill. Typ. Lep. Het. iii. p. 63, pl. lvi. fig. 12 (1879).

I took examples at Fusan in June and at Nagahama, Tsuruga, and Gensan in July.

Yokohama (*Jonas*); Fusan, Nagahama, Tsuruga, Gensan (*Leech*).

433. HERMINIA INNOCENS.

Herminia innocens, Butl. Ill. Typ. Lep. Het. iii. p. 63, pl. lvi. fig. 10 (1879).

A few examples, coll. Pryer.

My native collector took specimens at Gensan, July 1888. I obtained specimens at Ningpo in April 1886, and my native collector took examples at the same place in June and July of that year

Yokohama (*Jonas*); Gensan (*Nat. Coll.*); Ningpo (*Leech*); Ichang (*Pratt*).

434. SIMPLICIA RECTALIS.

Herminia rectalis, Eversm. Bull. Mos. 1842, iii. p. 558; Herr.-Schäff. fig. 606.

Herminia sicca, Butl. Ill. Typ. Lep. Het. iii. p. 62, pl. lvi. fig. 7 (1879).

Simplicia rectalis, Guen. Delt. p. 52.

A few examples, coll. Pryer.

I took specimens at Nagasaki in June and Gensan in July.

Yokohama (*Jonas* and *Manley*); Nagasaki, Gensan (*Leech*); Kiukiang (*Pratt*).

435. EDESSENA HAMADA.

Renodes hamada, Feld. Reis. Nov. pl. cxix. fig. 23.

A nice series, coll. Pryer.

I have received examples from Mr. Manley, and in May 1886 I took specimens in Satsuma.

Yokohama (*Pryer* and *Manley*); Satsuma (*May*); Ichang (*Pratt*).

436. CIDARIPLURA GLADIATA.

Cidariplura gladiata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 365 (1879).

I took specimens at Fushiki in July.

Yokohama (*Pryer*); Fushiki (*Leech*); Ichang (*Pratt*).

437. BLEPTINA INCULTALIS, sp. n. (Plate LIII. fig. 11.)

♀. Pale brown, suffused with darker; inner line of primaries black, indented and slightly curved; exterior line black, elbowed and curved, preceded by a faint fuscous central shade; submarginal line angulated, broad, blackish, edged externally with whitish; reniform linear, black: secondaries traversed by two black lines, both

edged with paler towards abdominal margin; a black line on the outer margin before the pale-brown dark-spotted fringes. Under surface of primaries pale fuscous brown, with a black central spot, serrated slightly curved line, and a blackish transverse submarginal shade; secondaries whitish brown, central spots and two transverse lines black. A black spot on last segment of abdomen above.

Expanse 23 millim.

I took one female example of this species at Fushiki in July 1886.

438. Bleptina spacoalis.

Bleptina spacoalis, Walk. Cat. Lep. Het. xix. p. 872 (1859).

Three specimens, coll. Pryer.

I took examples at Tsuruga in July and Hakodate in August, and my native collector took others at Gensan and Ningpo in July.

Tsuruga, Hakodate (*Leech*); Gensan, Ningpo.

439. Bleptina metisalis.

Bocana metisalis, Walk. Cat. Lep. Het. xvi. p. 183 (1858).

Bleptina dimissalis, Walk. Cat. Lep. Het. Suppl. iv. p. 1162 (1865); Butl. Trans. Ent. Soc. 1881, p. 580.

Tokio (*Fenton*); Swan River, Moreton Bay.

440. Bleptina petrina.

Bleptina petrina, Butl. Ill. Typ. Lep. Het. iii. p. 64, pl. lvi. fig. 13 (1879).

Yokohama (*Jonas*).

441. Bleptina ægrota.

Bleptina ægrota, Butl. Ill. Typ. Lep. Het. iii. p. 65, pl. lvii. fig. 1 (1879).

Several specimens, coll. Pryer.

I took examples at Nagasaki in June, and my native collector at Gensan in July.

Yokohama (*Jonas*); Nagasaki (*Leech*); Gensan (*Nat. Coll.*).

442. Bleptina lignea.

Bleptina lignea, Butl. Ill. Typ. Lep. Het. iii. p. 64, pl. lvi. fig. 14 (1879).

I took two specimens at Gensan in July.

Yokohama (*Jonas*); Gensan (*Leech*).

443. Hydrillodes lentalis.

Hydrillodes lentalis, Guen. Delt. p. 66 (1854).

Bleptina morosa, Butl. Ill. Typ. Lep. Het. iii. p. 64, pl. lvi. fig. 15 (1879).

A few specimens, coll. Pryer.

I took this species at several places in Japan from May to Sep-

tember, and my native collector met with it at Gensan in June and July.

Yokohama (*Jonas*); Nagasaki, Fushiki, Tsuruga, Nikko (*Leech*); Hakodate, Gensan (*Nat. Coll.*); Chang Yang (*Pratt*); N. India.

444. EPIZEUXIA MACULIFERA.

Epizeuxia maculifera, Butl.

One example, coll. Pryer.

I took a specimen at Gensan in July.

Yokohama (*Pryer*); Gensan (*Leech*).

445. ILYRGIS ECHEPHUREALIS.

Ilyrgis echephurealis, Walk. Cat. Lep. Het. xix. p. 880 (1859).

I took three specimens at Nagasaki in May.

Nagasaki (*Leech*); Ceylon.

446. BERTULA RAPTATALIS.

Bertula raptatalis, Walk. Cat. Lep. Het. xvi. p. 164 (1858).

I took two specimens in Satsuma in May 1886, and my native collector obtained several at Gensan in July 1887.

Satsuma (*Leech*); Gensan (*Nat. Coll.*); Ceylon.

447. BOCANA TRISTIS.

Bocana tristis, Butl. Ill. Typ. Lep. Het. iii. p. 65, pl. lvii. fig. 2 (1879).

Several examples, coll. Pryer.

My native collector took a specimen at Gensan in July.

Yokohama (*Jonas* and *Pryer*); Gensan (*Nat. Coll.*); Ichang (*Pratt*).

448. BOCANA NIPHONA.

Bocana niphona, Butl. Ill. Typ. Lep. Het. ii. p. 56, pl. xxxviii. fig. 9 (1878).

Yokohama (*Jonas*).

449. BOCANA INCONGRUENS.

Bocana incongruens, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 448.
Nodaria? amurensis, Staud. Stett. ent. Zeit. 1888.

One example, coll. Pryer.

I took a specimen at Gensan in July.

Yokohama (*Pryer*); Gensan (*Leech*); Amurland.

450. MESOPLECTRA LILACINA.

Mesoplectra lilacina, Butl. Ill. Typ. Lep. Het. iii. p. 65, pl. lvii. fig. 5 (1879).

One specimen, coll. Pryer.

Yokohama (*Jonas*); Dharmsala, Chekiang.

451. Saraca trimantesalis.

Egnasia trimantesalis, Walk. Cat. Lep. Het. xvi. p. 220 (1858).

I took specimens in Satsuma and at Nagasaki in May, and my native collector met with others at Gensan in July.

Satsuma, Nagasaki (*Leech*); Gensan (*Nat. Coll.*); Ichang (*Pratt*); Silhet.

452. Saraca indentalis, n. sp. (Plate LII. fig. 4.)

♀. Pale brown, varied with darker brown; first transverse line of primaries black, with an inward angulation below the costa; second line black obtusely angulated, preceded by a chestnut-brown band edged internally with dark brown, beyond there is a large whitish triangular spot on the costa, edged outwardly with chocolate-brown and followed by another whitish blotch at apex, below the whitish triangle the second line is bordered externally with blackish grey; submarginal line blackish, wavy and edged with whitish; orbicular punctiform black, reniform indistinctly outlined with blackish. Secondaries: black central spot and two transverse lines edged with grey, a series of black spots represent the submarginal line; fringes brown, tipped with paler except at the angles, where they are blackish. Under surface of primaries fulvous brown, whitish along the costa and apical portion of outer border; two dark transverse lines, the outer followed by a dark grey shade; discal spots white with a dark grey dot at each extremity: secondaries fulvous brown, traversed by two dark lines, the outer followed by a dark grey band; discal spot white with a black spot at each end, connected by a fine blackish line, submarginal line dark and wavy; fringes brown intersected by a darker line, and tipped with paler except at the angles.

Expanse 30 millim.

I took three specimens in Satsuma in May, three at Nagasaki in June, and one at Gensan in July. My native collector took one at Ningpo in June, and I have received one from Hakodate, also taken in June by a native.

The sexes do not differ in colour or markings, but the ♀ specimen figured and described has been selected for its fine condition.

453. Saraca flavomacula.

Pangrapta flavomacula, Staud. Stett. ent. Zeit. 1888.

I took this species at Ningpo in April, at Gensan in June, and Tsuruga in July.

Tsuruga, Gensan, Ningpo (*Leech*); Chang Yang (*Pratt*); Amurland.

454. Saraca textilis, n. sp. (Plate LII. fig. 12.)

Whitish, sprinkled on the discal area with brownish scales; inner line of primaries brown, curved, slightly serrated, and interrupted by the pale-centred brown-outlined orbicular; reniform pale, indistinctly outlined with brownish, enclosing a darker curved transverse line; outer line duplicated, enclosed space thickly sprinkled with brown

scales, forming a dark band, angulated at the middle, from whence a dark brown bar is projected through to the pale brown fringes; submarginal line whitish, bordered externally with brownish; fringes preceded by a dark brown line. Secondaries: inner and outer lines brown, the enclosed area containing a large whitish spot, in the centre of which is a curved transverse line; submarginal line broad, serrated and edged with brown; fringes pale brown darker at base and tips. Under surface whitish; markings as above, but the line on primaries not double.

Expanse 30 millim.

Allied to *Pangrapta flavomacula*, Staud., but whiter in colour.

I took two female examples of this species, one at Gensan in July and the other at Foochau in April 1886. My native collector took a male example at Ningpo in June of the same year.

455. SARACA VASAVA.

Egnasia vasava, Butl. Trans. Ent. Soc. 1881, p. 582.
Pangrapta incisa, Staud. Stett. ent. Zeit. 1888.

My native collector took an example at Hakodate in June.

Yokohama (*Pryer*); Hakodate (*Nat. Coll.*); Chang Yang (*Pratt*); Raddefskaia and Wladiwostok (*Christoph*).

456. SARACA COSTINOTATA.

Saraca costinotata, Butl. Trans. Ent. Soc. 1881, p. 581.

One specimen, coll. Pryer.

I took examples at Nagasaki in June.

Yokohama (*Pryer*); Nagasaki (*Leech*).

457. SARACA SUBVIOLACEA.

Saraca subviolacea, Butl. Trans. Ent. Soc. 1881, p. 581.

I took specimens at Satsuma and Nagasaki in May, and my native collector obtained others at Gensan in July.

Yokohama (*Pryer*); Satsuma, Nagasaki (*Leech*); Gensan (*Nat. Coll.*).

458. HARMATELIA BIFIDALIS.

Harmatelia bifidalis, Leech, Entom. xxii. p. 64, pl. ii. fig. 11 (1889).

Two specimens taken by myself at Hakodate, August 1886.

Hakodate (*Leech*).

459. EGNASIA POLYBAPTA.

Egnasia polybapta, Butl. Ill. Typ. Lep. Het. iii. p. 66, pl. lvii. fig. 7 (1879).

One example, coll. Pryer.

I took examples in Satsuma and at Nagasaki in May and at Gensan in July. I have also received specimens from Mr. Manley.

Yokohama (*Jonas* and *Manley*); Satsuma, Nagsaki, Gensan (*Leech*).

460. EGNASIA PUSILLA.

Egnasia pusilla, Butl. Ill. Typ. Lep. Het. iii. p. 67, pl. lvii. fig. 9 (1879).

Four examples, coll. Pryer.

I took three specimens at Fushiki in July.

Yokohama (*Jonas*); Fushiki (*Leech*).

461. EGNASIA PULCHERRIMA.

Egnasia pulcherrima, Butl. Ill. Typ. Lep. Het. iii. p. 67, pl. lvii. fig. 8 (1879).

Several specimens, coll. Pryer.

I obtained this species at Nagasaki and Gensan in June.

Yokohama (*Jonas*); Nagasaki and Gensan (*Leech*).

462. EGNASIA EREBINA.

Egnasia erebina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 450 (1879).

Yokohama (*Pryer*).

463. EGNASIA PORPHYREA.

Egnasia porphyrea, Butl. Ill. Typ. Lep. Het. iii. p. 66, pl. lvii. fig. 6 (1879).

One example, coll. Pryer.

Yokohama (*Jonas* and *Pryer*).

464. EGNASIA FALLAX.

Egnasia fallax, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 450.

One example, coll. Pryer.

I took specimens at Nagasaki in May and at Foochau in April.

Nagasaki, Foochau (*Leech*); Yokohama? (*Pryer*).

465. EGNASIA OPALINA.

Egnasia opalina, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 451.

Three examples, coll. Pryer.

I took specimens at Nagasaki in June, and Mr. Andrews obtained the species at Hakodate.

Hakodate (*Andrews*); Yokohama? (*Pryer*); Nagasaki (*Leech*).

466. EGNASIA SIMPLEX.

Egnasia simplex, Butl. Ill. Typ. Lep. Het. iii. p. 66, pl. lvii. fig. 5 (1879).

I took specimens in Satsuma in May, at Nagasaki in June, and Tsuruga in July.

Yokohama (*Jonas*); Satsuma, Nagasaki, Tsuruga (*Leech*); Ichang (*Pratt*).

467. OLYBAMA JAPONICA.

Olybama japonica, Butl. Trans. Ent. Soc. 1881, p. 583.

Tokio (*Fenton*).

468. MERANDA INCONSPICUA.

Meranda inconspicua, Butl. Trans. Ent. Soc. 1881, p. 583.

I have received one specimen frow Mr. Manley, and I took the species at Nagasaki in May and Ningpo in April; my native collector also took specimens at the latter place in June.

Yokohama (*Manley* and *Pryer*); Nagasaki, Ningpo (*Leech*).

469. MERANDA TRISTALIS.

Meranda tristalis, Leech, Entom. xxii. p. 65, pl. ii. fig. (1889).

One male specimen taken by myself in Satsuma, May 1886.

Satsuma (*Leech*).

470. CELEOPSYCHE NITENS.

Celeopsyche nitens, Butl. Ill. Typ. Lep. Het. iii. p. 68, pl. lvii. fig. 10 (1879).

Yokohama (*Jonas*); Shanghai, Tokio, Chekiang.

471. MARMORINA OBSCURATA.

Marmorina obscurata, Butl. Ill. Typ. Lep. Het. iii. p. 68, pl. lvii. fig. 11 (1879).

I took specimens in Satsuma and at Nagasaki in May; my native collector obtained others at Hakodate in June.

Hakodate (*Whitely*); Satsuma, Nagasaki (*Leech*).

472. MARMORINA AMPHIDECTA.

Marmorina amphidecta, Butl. Ill. Typ. Lep. Het. iii. p. 69, pl. lvii. fig. 12 (1879).

Three examples, coll. Pryer.

I took specimens at Tsuruga and Nagahama in July, and Mr. Smith at Hakone in August.

Yokohama (*Jonas*); Tsuruga, Nagahama (*Leech*), Hakone (*Smith*).

473. AMBLYGOES ALBINOTATA.

Amblygoes albinotata, Butl. Ann. & Mag. Nat. Hist. (5) iv. p. 449 (1879).

Yokohama (*Pryer*).

474. MARAMATHA STRAMINEA.

Maramatha straminea, Butl. Ill. Typ. Lep. Het. iii. p. 70, pl. lviii. fig. 2 (1879).

A few specimens, coll. Pryer.

I took examples of this species at Gensan in June.

Yokohama (*Jonas* and *Pryer*); Gensan (*Leech*).

EXPLANATION OF THE PLATES.

Plate L.

Fig. 1. *Agrotis informis*, sp. n., p. 500.
2. *Orthosia fausta*, sp. n., p. 513.
3. *Agrotis undosa*, sp. n., p. 501.
4. *Noctua tarda*, sp. n., p. 495.
5. *Moma confusa*, sp. n., p. 480.
6. *Acronycta subornata*, sp. n., p. 477.
7. *Leucania flavostigma*, Butl., var. *inornata*, var. n., p. 482.
8. —— *nigrilinea*, sp. n., p. 482.
9. *Dipterygia japonica*, sp. n., p. 480.
10. *Xylina saxea*, sp. n., p. 537.
11. *Berrhæa japonica*, sp. n., p. 507.
12. *Mamestra cuneata*, sp. n., p. 486.

Plate LI.

Fig. 1. *Mesogona quadrilinea*, sp. n., p. 519.
2. *Hadena stolida*, sp. n., p. 509.
3. *Xylophasia tychoona*, sp. n., p. 488.
4. *Euplexia japonica*, sp. n., p. 504.
5. *Lamprosticta venusta*, sp. n., p. 504.
6. *Agriopis viridis*, sp. n., p. 502.
7. *Miselia funesta*, sp. n., p. 503.
8. *Leucyma nigrilinea*, sp. n., p. 522.
9. *Gortyna edentata*, sp. n., p. 485.
10. *Cerastis albipuncta*, sp. n., p. 514.
11. *Calymnia pryeri*, sp. n., p. 516.
12. *Hadena unica*, sp. n., p. 509.

Plate LII.

Fig. 1. *Selepa manleyi*, sp. n., p. 479.
2. *Hypena similalis*, sp. n., p. 558.
3. *Glottula squalida*, sp. n., p. 490.
4. *Saraca indentalis*, sp. n., p. 567.
5. *Remigia nigrisigna*, sp. n., p. 553.
6. *Plada multiplicans*, var. *japonica*, var. n., p. 538.
7. *Gonitis distincta*, sp. n., p. 506.
8. —— *pryeri*, sp. n., p. 506.
9. *Erastria squalida*, sp. n., p. 527.
10. *Hypena albopunctalis*, sp. n., p. 557.
11. *Naxia coreana*, sp. n., p. 560.
12. *Saraca textilis*, sp. n., p. 567.

Plate LIII.

Fig. 1. *Erastria olivacea*, sp. n., p. 526.
2. —— *brunnea*, sp. n., p. 527.
3. —— *flavipuncta*, sp. n., p. 524.
4. —— *flavicollis*, sp. n., p. 525.
5. *Catocala puella*, sp. n., p. 551.
6. —— *separans*, sp. n., p. 552.
7. —— *intacta*, sp. n., p. 548.
8. *Ophiusa algira*, var. *curvata*, var. n., p. 546.
9. *Erastria rosacea*, sp. n., p. 527.
0. *Acontia pulchella*, sp. n., p. 524.
11. *Bleptina incultalis*, sp. n., p. 564.
12. *Periyea gemella*, sp. n., p. 492.

3. On Associated Remains of a Theriodont Reptile from the Karoo System of the Cape. By R. Lydekker, B.A., F.G.S., F.Z.S.

[Received September 19, 1889.]

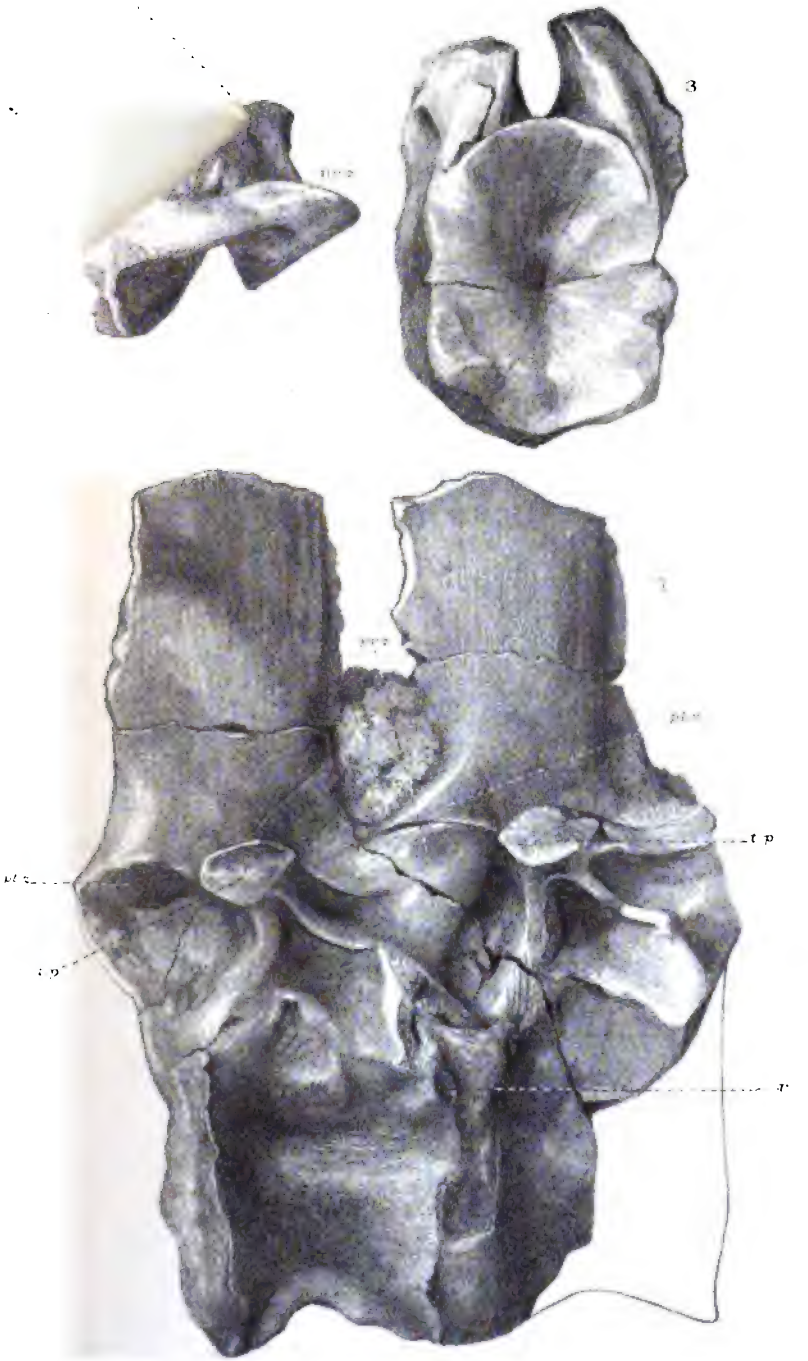
(Plates LIV. & LV.)

The remains of Anomodont Reptiles from the great Karoo system of the Cape Colony are so rarely found in associated sets that every instance of such association is of especial interest and importance, and I accordingly bring to the notice of the Society a series of associated, although imperfect, bones, presented in 1884 to the British Museum by Mr. C. S. Orpen, of Smithfield in the Orange Free State.

These specimens (Brit. Mus. No. R. 533) were obtained from the Karoo system of the Rouxville District, Orange Free State, and probably from the Beaufort stage, although I cannot be certain on the latter point. The bones retain portions of a brick-red ferruginous matrix, which is frequently very closely adherent to them, and with the colour of which they are much impregnated. This matrix so closely resembles that in which the reptilian bones are found in the Maleri stage of the Gondwana system of Central India, that if the specimens had been shown to me without any clue to their locality I should have said that they were probably of Indian origin. The majority of the fossils in the British Museum from the Beaufort beds are of a blackish or brownish-grey colour; but according to Prof. A. H. Green red beds are of common occurrence on this horizon. The fossils in the Museum of the Royal College of Surgeons from the overlying Stormberg beds, catalogued by Sir R. Owen under the name of *Massospondylus*, exhibit a similar red matrix.

The series of specimens comprises a number of more or less imperfect vertebræ from the dorsal and caudal regions, and several imperfect bones of the limbs and limb-girdles. Unfortunately, however, there is no trace of a tooth or any portions of the skull,—a circumstance which is the more to be regretted, since the South-African representatives of the Theriodont suborder of the Anomodonts (to which suborder these specimens belong) have been mainly founded upon the evidence of the skulls and teeth. The specimens I select for description are certain of the vertebræ and an imperfect scapula and humerus.

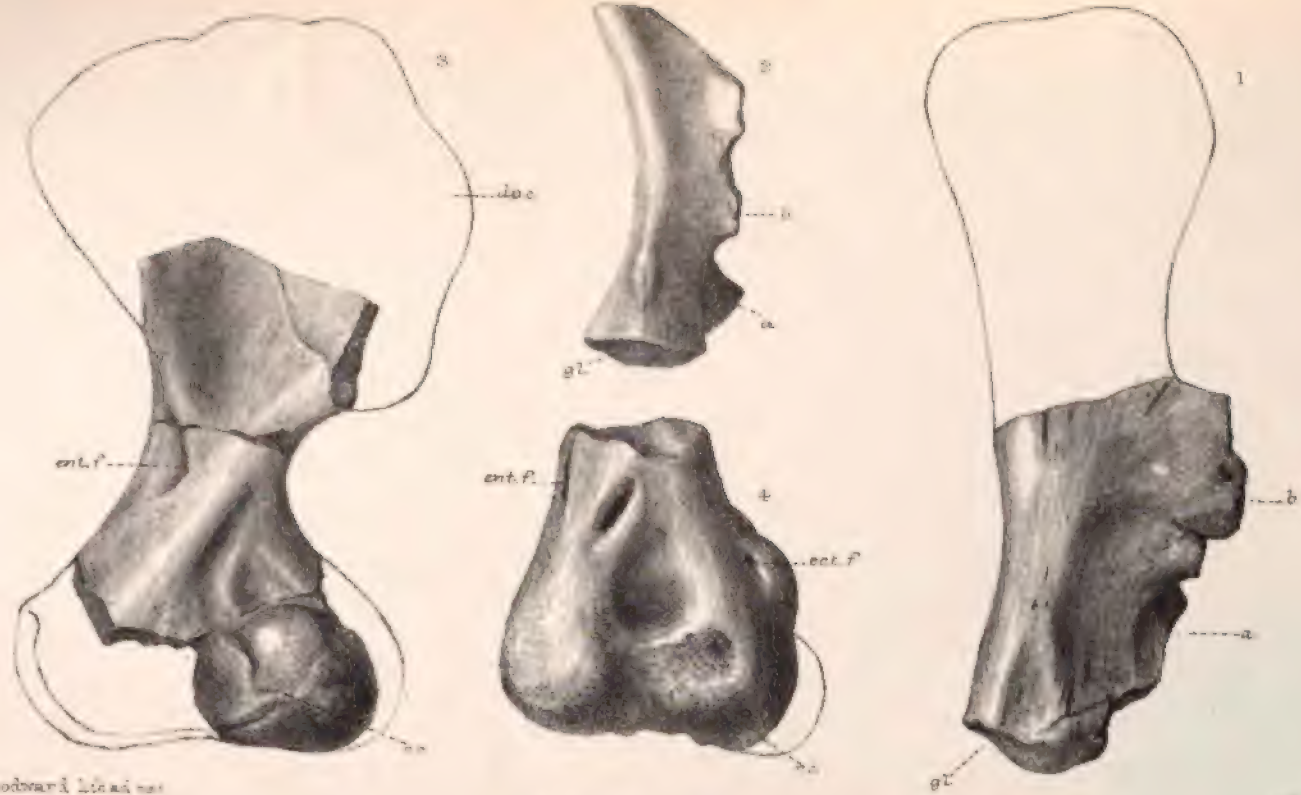
Of the vertebræ two somewhat imperfect dorsals, cemented together by matrix, are represented from the right side in Plate LIV. fig. 1, on a scale of two thirds the natural size. These specimens, although somewhat flattened by pressure, exhibit the entire contour of the centrum and neural spine, and also show the peculiar characters of the transverse processes and the position of the zygapophyses. The two latter features are, however, exhibited still more clearly by the imperfect arch of a dorsal represented in fig. 2 of the same Plate. The centra of the dorsal vertebræ are of considerable length, and



Theriodont Vertebræ.

E.C.Woodward lith.ad nat.

West Newman imp.



E.C.Woodward Lith.

West, Newman imp.

Theriodont Limb-bones

somewhat compressed from side to side; and the neural spines are likewise flattened, and of moderate length and height. Their terminal faces are but slightly cupped, and show a notochordal canal penetrating towards the middle of the vertebra. The transverse processes (*t.p*) are of moderate length, and directed backwardly as well as outwardly. These transverse processes are strengthened by three plate-like buttresses arising from the sides of the arch, and recalling the structure observed in the dorsal vertebræ of *Megalosaurus*. A trace of a rib-facet is observable on the anterior border of the centra of these vertebræ, which probably indicates that they belong to the earlier part of the series. The hæmal aspect has a sharp carina. Intercentra were totally wanting in this part of the spinal column. The total height of these vertebræ is 6·7 inches, the vertical diameter of the centrum being 2·4 inches.

Somewhat larger trunk-vertebræ probably belong to the lumbar region, an imperfect specimen being represented from the anterior aspect in fig. 3 of the same Plate. In this specimen the centrum is very much shorter than in the dorsals, but the hæmal carina is still sharper. In the caudals, of which there are three in apposition, the centrum again lengthens, and the hæmal carina becomes less sharp. Chevrons were certainly present, but whether intercentra occurred in this region cannot be satisfactorily determined.

The apparently notochordal character of these vertebræ indicates that this series of specimens does not belong to the Dicynodont suborder of the Anomodonts. Notochordal vertebræ are met with both in the Pariasaurian and Theriodont subdivisions of that order; but since the associated humerus to be immediately noticed accords with that of the Theriodonts and is quite different from the type apparently referable to the Pariasauria[1], there seems every reason for regarding these specimens as referable to the Theriodontia.

Turning to the bones of the appendicular skeleton, we have first to consider the scapula, of which the proximal portion of that of the right side is preserved. This specimen is represented from the dorsal aspect in Plate LV. fig. 1, on a scale of one third, with a restoration of the missing half from the scapula described by Sir R. Owen as *Platypodosaurus*. The proximal portion of this bone agrees so closely in general characters with the latter specimen, as figured by its describer (Quart. Journ. Geol. Soc. vol. xxxvi. pl. xvii. fig. 1), that there is no necessity for a detailed description. It will be seen that the process marked *a* in the figure corresponds with that marked *f* in Owen's plate, while the one here marked *b* represents *e* of the latter.

In regard, however, to the homology of these two processes with those of other Dicynodont scapulæ, it is necessary to make a few remarks, since some confusion has arisen between the two. In his 'Catalogue of the Fossil Reptilia of South Africa,' Sir R. Owen figured, in plate lxx. fig. 1, the ventral aspect of the right scapula of a species of *Dicynodon*, with a portion of the precoracoid attached

[1] Described by Prof. Seeley (Proc. Roy. Soc. vol. xliv. p. 142, 1888) as *Propappus*. The writer will take a later opportunity of giving his reasons for this reference.

to a process on the preaxial border, which he identifies with the acromial process of the Monotreme scapula, and marks by the letter *e*. This process is separated by a deep notch from the glenoidal region of the bone; and above this process there is a long and deep emargination of the preaxial border (*b* of the figure), superiorly to which the distal extremity of the bone is expanded. Now from the absence of any other process between that marked *e* and the distal expansion of the bone, as well as from the general similarity in the position of the process in question, I am inclined to consider that its identification with the acromial process of the Monotreme scapula is in all probability correct. If this be so, the pectoral girdle of the Anomodonts will differ from that of the Monotremes in that the precoracoid—which I regard as the representative of the so-called epicoracoid of the latter—extended upwards to join the acromion.

In plate lxix. figs. 5, 6, of his 'Catalogue,' Sir R. Owen figured a portion of the right side of a smaller pectoral girdle, which I have reason to believe belongs to the genus *Ptychosiagum*[1] (*Ptychognathus*). Now in this specimen the scapula gives off a preaxial process for articulation with the precoracoid, which is clearly homologous with the one termed acromial in the preceding specimen, and is so lettered by Sir R. Owen. This acromial process differs, however, from that of *Dicynodon* in that it is separated only by a groove on the ventral aspect of the bone from the glenoidal region. Above this acromial process there is a shallow notch, on the dorsal side of which there occurs a projection which is shown by other specimens to be the distal extremity of the supraglenoidal portion of the preaxial border of the bone. The relations of these two processes are well shown in the right scapula of *Ptychosiagum orientale* represented in Plate LV. fig. 2, where it is quite clear that the upper or supra-acromial process *b* corresponds to *b* of Owen's figure. In redescribing the Owenian specimen in the 'Phil. Trans.' for 1888, p. 492, fig. 1, Professor Seeley correlates the process *b* with the acromion, not mentioning, however, what he would regard as the acromion in the scapula of *Dicynodon*, where, as we have seen, there is no process in the same position as *b*, or giving any reasons for his rejection of the determination of Sir R. Owen. Now it will be quite evident from the comparison of figs. 1 and 2 of Plate LV. that the processes marked *a* and *b* are homologous with one another, and consequently that *a* represents the one identified with the acromion in *Dicynodon*. In describing, however, the scapula of *Platypodosaurus* (Quart. Journ. Geol. Soc. vol. xxxvi. pl. xvii. fig. 1) Sir R. Owen wrongly identified the supra-acromial process (*e* of his figure) with the acromial of *Dicynodon*, regarding the true representative of the latter (*f* of his figure) as a portion of the glenoidal region; whereas it will be evident from a comparison of Owen's figure with Plate LV. that his *e* corresponds with *b* and his *f* with *a* of the latter, which we have shown to be the acromial of *Dicynodon*.

If, therefore, the process in the scapula of *Dicynodon* with which the precoracoid articulates is rightly identified with the acromial of

[1] I have proposed this name in place of *Ptychognathus*, which is preoccupied.

the Monotremes, it is evident that the process marked *a* in Plate LV. also represents the same. Further it is manifest that the process *b* is the distal extremity of part of the preaxial border of the scapula, which has become twisted from the line of the acromion towards the dorsal aspect, this being most marked in *Ptychosiagum* (fig. 2). This dorsal torsion of the preaxial border of the scapula is a very remarkable feature, and appears to support Professor Flower's view that the preaxial border of the Monotreme scapula represents the spine of the scapula of the higher Mammals. Thus in the scapula of *Ptychosiagum* the body of the bone has become to a great extent three-sided, and the surface on the inner side of the preaxial border would well represent the prescapular fossa of the higher mammals, the portion on the outer side of the same the postscapular fossa, and the somewhat rounded posterior surface (left side of figure) the subscapular fossa. If, as seems most probable, we really have in this type of scapula an indication how the reptilian scapula of the Monotremes was modified into that of the higher mammals, and the acromion is rightly identified, we shall further have to assume that the acromial process also subsequently received a dorsal torsion, so as to resume its original position at the distal extremity of the preaxial border, now converted into the spine.

After this long digression it will suffice to add that the scapula of the form under consideration corresponds very closely to that described as *Platypodosaurus*.

The humerus is represented by the somewhat imperfect distal half of that of the left side, a restored figure of which is given in Plate LV. fig. 3, on a scale of one third. This specimen shows the entepicondylar foramen underlying a bar situated in the usual position on the palmar aspect of the shaft. The radial condyle is large and well preserved, and above this there is the supinator flange on the preaxial border which serves to distinguish the humerus of the Theriodonts from that of the Dicynodonts. Unfortunately, however, this flange is imperfect, so that it cannot be determined whether there was an ectepicondylar foramen.

Compared with the Anomodont humeri in the British Museum this specimen agrees very closely, both in size and contour, with the cast of the corresponding portion of a left humerus from the Permian of Russia described under the name of *Brithopus*[1]. The Russian specimen (Plate LV. fig. 4) has been a good deal damaged, and its radial condyle has been broken away; but allowing for this imperfection the general resemblance between the two specimens is very close. Trusting to this resemblance in the distal extremities of the two humeri the proximal extremity of the African bone has been restored, partly from a Russian specimen doubtless referable to *Brithopus*[2], and partly from the large African humerus figured in pl. xii. of Owen's 'Catalogue,' as *Pariasaurus*, but which more probably belongs to *Tapinocephalus*. The present specimen appears to be distinguished

[1] For synonymy, see Owen, Quart. Journ. Geol. Soc. vol. xxxii. p. 352 *et seq.*

[2] *Vide* Owen, *loc. cit.*

from the humerus of *Brithopus* in that the postaxial aperture of the entepicondylar foramen is situated on the palmar instead of the postaxial border of the bone; but this is due to the imperfection of the latter border in the type of *Brithopus*.

Having now described those of the associated series of bones which appear best worthy of notice, it remains to consider whether they can be referred to any form hitherto described. In cases like the present where, from the want of homologous portions of the skeleton, there is no decisive evidence as to whether specimens can be referred to a previously described form, by far the easiest and simplest course is to make their owner the type of a new genus. As a rule, however, this very easy course turns out to be an erroneous one, and it is therefore not the one which I propose to follow on this occasion.

If, as seems to be the case, the humerus represented in plate xix. fig. 1, of Owen's 'Catalogue,' is rightly referred to *Cynodraco major* —the largest of the typical Theriodontia—it is quite clear, from the larger size and different contour of the humerus, that the present series of specimens cannot be referred to that restricted group, which may be conveniently designated as the *Galesauridæ*. Moreover, although we have no decisive evidence of the nature of the vertebræ in the *Galesauridæ*, yet there are some reasons for considering that these were not of the notochordal type of the present form. Again, it is quite clear that these specimens indicate a Theriodont which is generically distinct from the large types described under the names of *Tapinocephalus*, *Titanosuchus*, and *Pariasaurus*, the vertebræ and humeri which appear to be referable to the two former genera being greatly larger and differing in contour from those of the present series.

Recently, indeed, Professor Seeley[1] has described and figured a large imperfect tooth from the Karoo system of the Cape preserved in the British Museum (No. 49425) under the name of *Glaridodon*; but there is nothing by which this specimen can be generically distinguished from the teeth of *Titanosuchus*[2], so that *Glaridodon* may be a synonym of that genus.

There is not sufficient evidence to show that the form under consideration does not belong to the Permian *Brithopus*, and I therefore refrain from giving it a new name. Additional evidence of its affinity to that form is afforded by the vertebræ figured in Eichwald's 'Lethæa Rossica,' pl. lix. figs. 1, 2, and described as *Deuterosaurus*. These vertebræ are smaller than those of our series, but appear to be of the same general type, showing similar long transverse processes, a sharp hæmal carina to the centra, and the shortening of the latter in the lumbar region. These vertebræ, judging from the present series, are too small to have belonged to the same individual as the type of *Brithopus*, but may indicate a smaller example of the same genus. So far, indeed, as I can see, there is no reason why

[1] Proc. Roy. Soc. vol. xliv. p. 135 (1888). In the absence of any specific name the genus is invalid.

[2] The tooth described as *Glaridodon* has been recently cut in order to exhibit a section of the root.

Deuterosaurus should not be identical with *Brithopus*, in which event the latter name should stand. If the skull referred to *Deuterosaurus* indicate an animal of the same size as the type of *Brithopus*, it would be evident that the incisor teeth were of larger size in proportion to the limb-bones than in *Titanosuchus*.

EXPLANATION OF THE PLATES.

Plate LIV.

Associated vertebræ of a Theriodont from the Karoo system of the Cape Colony, ⅔ nat. size.

Fig. 1. Right lateral aspect of two dorsal vertebræ.
2. Reversed view of the left side of an imperfect neural arch of a dorsal vertebra.
3. Anterior aspect of an imperfect lumbar vertebra.

pr.z, prezygapophysis; *pt.z*, postzygapophysis; *t.p*, transverse process; *r*, facet for capitulum of rib.

Plate LV.

Fig. 1. Dorsal aspect of the restored right scapula of a Theriodont from the Karoo system of the Cape. ½. *a*, acromial process; *b*, supra-acromial process; *gl*, glenoidal surface.
2. Dorsal aspect of the imperfect right scapula of *Ptychosiagum orientale* from the Panchet beds of the Gondwana system of India. ½. Letters as in fig. 1.
3. Palmar aspect of the restored left humerus belonging to the same individual as the scapula represented in fig. 1. ½. *ent.f*, entepicondylar foramen; *r.c*, radial condyle.
4. Palmar aspect of the distal portion of the left humerus of *Brithopus priscus*, from the Permian of Russia. ½. *ect.f*, ectepicondylar foramen; other letters as in fig. 3.

4. Descriptions of thirteen new Species of Land-Shells, with a Note on *Bulimus fulminans*. By G. B. Sowerby, F.L.S., F.Z.S.

[Received October 3, 1889.]

(Plate LVI.)

1. Helix (Geotrochus) horderi, n. sp. (Plate LVI. fig. 1.)

H. *testa anguste perforata, elata, conica, solidiuscula, oblique subtilissime striata, citrina; spira elata, apice acuta; anfractus 6, convexiusculi, ultimus leviter inflatus, ad peripheriam obsolete angulatus, basi convexus; apertura lata, obliqua; peristoma late expansum et reflexum, columellari intus tubercula parva dentiformi munito, extus dilatato, complanato.*

Alt. 35, *maj. diam.* 30 *mill.*

Hab. Nova Guinea.

A fine yellow trochiform species presenting a character quite unusual in the "*Geotrochus*" section, namely, a tooth-like nodule on the inside of the columellar lip.

2. HELIX (CORASIA) WOODFORDI, n. sp. (Plate LVI. fig. 6.)

H. *testa imperforata, subconica, tenuis, pellucida, lutescente alba, irregulariter malleata, oblique striata; spira breviter conica, obtusiuscula; anfractus* 4, *rapide accrescentes, convexiusculi, ultimus inflatus, ad peripheriam acute carinatus, linea carinali opaca alba; apertura ampla, obliqua; peristoma tenuiter reflexum, rubrum.*

Alt. 15, *diam.* 19 *mill.*

Hab. Guadalcanar, Inss. Salomonis.

A pretty, delicate, transparent shell, allied to *H. lactiflora*, but of a lighter substance and smaller size, characterized by a somewhat prominent white keel and a thin pink lip. Specimens of this species were collected by Mr. Woodford in the above-mentioned locality, and presented to the National Museum.

3. TROCHOMORPHA GODETI, n. sp. (Plate LVI. fig. 10.)

T. *testa late et profunde umbilicata, depressa, tenuiuscula, oblique striata, fulvo-cornea, fasciis castaneis angustis* 2, *ad peripheriam ornata; spira levissime elevata; sutura impressa, carinata; anfractus* $5\frac{1}{2}$, *convexiusculi, ultimus non descendens, haud carinatus; umbilicus* $\frac{1}{3}$ *diametri æquans; apertura obliqua, subovalis; peristoma paulo reflexum.*

Diam. 19, *alt.* 9 *mill.*

Hab. Guadalcanar, Inss. Salomonis (*Woodford*).

4. BULIMUS SUPERSTRIATUS, n. sp. (Plate LVI. fig. 9.)

B. *testa imperforata, ovato-conica, solidiuscula, nitida, longitudinaliter rugata, spiraliter striata, castanea, nigro-fusco obscure flammulata et maculata; spira conica, apice acutiuscula; anfractus* 5, *convexiusculi, ad suturam crenulati, ultimus spiram superans, striis numerosis spiralibus incisis, basin versus evanidis sculptus; apertura ovalis, intus cæruleo-purpurea; peristoma vix incrassatum, luteum.*

Long. 54, *diam.* 29 *mill.*

Hab. Yquitos, Peruviæ.

Resembling *B. taylorianus* (Reeve), but spirally sculptured, thus presenting a character quite unusual in the genus and unknown among the species of this group.

5. BULIMUS SALTERI, n. sp. (Plate LVI. fig. 4.)

B. *testa imperforata, ovato-oblonga, solidiuscula, longitudinaliter irregulariter striata, rugose malleata, fulva, hic illic nigro-fusco sparsim radiata, maculis fuscis irregularibus conspersa; spira elongata, apice obtusa, sutura irregulariter subcrenulata; anfractus* 6, *convexiusculi, supremi minute granulosi, ultimus spiram superans, oblongus, leviter inflatus; apertura ovato-oblonga, intus dilute purpurascens, fusco-purpureo late limbata; peristoma vix incrassatum, haud reflexum, columella rectiuscula.*

Long. 70, *maj. diam.* 35 *mill.*

Var. γ. *Haud malleata, fusco sparsim radiata, sed non maculata; striis conspicuis, rugosis.*

Long. 86, *maj. diam.* 44 *mill.*

Hab. Catamarca, Andes Peruviæ.

The typical shell has a peculiarly malleated surface, and the indentations are rendered conspicuous by the brown markings. The variety, wanting these characters, presents so different an appearance that it might be taken for a distinct species. There is, however, but little difference in the form, the colouring of the mouth is the same, the brown rays also are similar in colour and disposition. The longitudinal striæ are closer and more regular, taking the place of the irregular indentations characteristic of the typical form.

The two shells form part of the collection of Mr. S. J. Da Costa, and there is a specimen of each variety in the National Collection at South Kensington.

6. Achatina barriana, n. sp. (Plate LVI. fig. 2.)

A. *testa ovato-conica, tenuis, cornea, maculis parvis fuscis ad suturam et ad peripheriam tæniata, maculis parvis albidis hic illic floccata; spira conica, apice obtusa; anfr.* 6, *convexiusculi, supremi læves, sequentes confertissime lirati, liris rugosis, ultimus spiram superans, inflatus; apertura ampla, vix obliqua; peristoma simplex, tenue; columella leviter inflexa, oblique truncata.*

Long. 43, *diam.* 23; *apert. longa* 24, *lata* 14 *mill.*

Hab. Calabar, Africa?

A light shell of elegant form, sculptured with very fine close corrugated ridges. The body-whorl is sprinkled with small white flake-like spots.

I have only seen two specimens of this species; they were found in company with *Perideris auripigmentum*, and are probably from the same locality.

7. Achatina smithi, n. sp. (Plate LVI. fig. 3.)

A. *testa ovato-turrita, tenuis, pellucida, cornea, nitida, strigis longitudinalibus numerosis undulatis pallidis picta; spira elatiuscula, turrita, apice obtusa; anfractus* 6, *convexi, spiraliter minutissime sed densissime striati, sutura impressa, haud crenulata; anfr. ultimus spiram paulo superans, leviter inflatus; apertura verticalis, sinuato-ovalis; peristoma simplex; columella recta, oblique truncata.*

Long. 30, *diam.* 15; *apert. longa* 14, *lata* 7 *mill.*

Hab. Calabar, Africa?

A delicate pellucid species; a true *Achatina*, but approaching in form and texture some of the species of *Glandina*. The longitudinal streaks are faint, but numerous and pretty regular; the spiral striæ seen through a lens are exceedingly fine and close.

Of this species I have only seen a single specimen; its habitat is uncertain, but it is probably from the same locality as *A. barriana*.

8. ACHATINA LINTERÆ, n. sp. (Plate LVI. fig. 11.)

A. *testa ovata, tenuis, nitens, alba, epidermide fulva induta, maculis conspicuis fuscis unifasciatim dispositis supra medium picta; spira conica, apice obtusa; sutura impressa, subcrenulata; anfractus 7, convexiusculi, grano-plicati; anfr. ultimus inflatus, supra obsolete grano-plicatus, deinde lævigatus; apertura verticalis, subovata, fauce albida cæruleo limbata; columella fere recta, dilute cærulescens; peristoma simplex, tenue, fusca.*

Long. 85, *diam.* 47 *mill.*

Hab. Port Elizabeth.

A very handsome species, of which the type (at present unique) is in Miss Linter's collection. It is distinguished from its congeners chiefly by a conspicuous row of brown blotches a little removed from the suture.

9. BULIMUS (BULIMINUS?) GOMEZI, n. sp. (Plate LVI. fig. 8.)

B. *testa anguste perforata, oblongo-conica, solidiuscula, polita, griseo-albida, flaveo-tincta, seriebus 2–3 macularum fuscarum cincta, nigro promiscue punctata, basi lineis 2 nigris ornata; spira elato-conica, apice acuta, nigra; anfractus 7, leviter convexi, læves; anfr. ultimus spiram fere æquans, subventricosus; apertura subovata, fauce nigro-fusca; peristoma acutum, album, marginibus callo tenuissimo junctis, margine columellari supra tenuiter dilatato, perforationem semi-occultante, fusco.*

Long. 21, *lat.* 13 *mill.*

Hab. Usagara, Africæ meridionalis.

A pretty species, somewhat allied to *B. venustus* (Morelet); rather solid, with a polished surface; greyish white, tinged with pale yellow near the suture, painted with rows of brown spots, a promiscuous scattering of black dots, and two blackish lines towards the base; the apex is black and the interior very dark brown. Several specimens, somewhat varying in the disposition of the spots, but with the same general characteristics, are in the collection of Mr. S. J. Da Costa.

10. BULIMUS (BULIMINUS?) HANNINGTONI, n. sp. (Plate LVI. fig. 7.)

B. *testa anguste rimata, pyramidali turrita, fusca, nitens, tenuis, longitudinaliter obsolete et irregulariter striata; spira elongato-conica, acuta; anfractus 10, convexiusculi; sutura impressa, anfractus ultimus ⅓ longitudinis æquans, paulo inflatus; apertura fere verticalis, ovata; peristoma simplex, acutum, marginibus callo tenuissimo junctis, margine columellari supra dilatato, perforationem occultante.*

Long. 16, *diam.* 6½ *mill.*

Hab. Usagara, Africæ meridionalis.

A small, horny species of the form of a *Stenogyra*, with a very acute spire. The type is in the collection of Mr. S. J. Da Costa.

11. Leptopoma woodfordi, n. sp. (Plate LVI. fig. 13.)

L. *testa profunde umbilicata, globoso-conica, tenuis, pellucida, albida, spiraliter lirata, oblique striata, ad peripheriam carinata; spira conica, parum elevata, acutiuscula; anfractus 5, convexi, rotundati; anfr. ultimus inflatus, infra lævigatus, convexus; apertura ampla, subcircularis; peristoma tenue, expansum, margine columellari angusto, extus angulato.*

Diam. 21, *alt.* 18 *mill.*

Hab. Guadalcanar, Ins. Salomonis.

A whitish, pellucid, spirally ridged species with rather a large, nearly circular mouth and thinly expanded lip. The columellar margin is narrow, with an angle on the outside. One of the specimens in the National Collection is 23 millim. in diameter, while another adult specimen does not exceed 15 millim.

12. Cyclostoma hanningtoni, n. sp. (Plate LVI. fig. 14.)

C. *testa umbilicata, globoso-conica, solidiuscula, undique spiraliter multilirata, striis incrementi decussata, sordide albida, grisco-radiata, fusco bifasciata; spira breviter conica, apice rufo-fusca, acutiuscula; anfractus 5, convexi, rotundati, ad suturam minutissime crenulati; anfr. ultimus brevis, basi rotundatus; apertura leviter obliqua, subcircularis, fauce fusca; peristoma tenue, leviter expansum, crenulatum, album.*

Diam. 24, *alt.* 23 *mill.*

Hab. Africa æquatorialis.

This species is allied to *C. insulare* (Pfr.), but it is considerably larger than any specimen I have seen of that species, the body-whorl is larger in proportion to the spire, and the spiral ridges are sharper and more prominent. The specimen, at present unique, is in the collection of Mr. S. J. Da Costa.

13. Bulimus (Mesembrinus?) bowkeri, n. sp. (Plate LVI. fig. 5.)

B. *testa subrimata, ovato-conica, tenuiuscula, longitudinaliter rugoso-striata, sulcis transversis irregularibus plus minusve cancellata, dilute purpurea, versus apicem fusca; spira elato-conica, apice obtusiuscula; sutura impressa, vix crenulata; anfractus 5, leviter convexi; anfr. ultimus spiram paulo superans, leviter inflatus, obliquiusculus, basi rotundatus, vix attenuatus; apertura obliqua, ovalis, intus aureo-fusca; peristoma simplex, rectum, margine dextro arcuato, albo; columellari fusco, superne tenuiter effuso.*

Long. 20, *maj. diam.* 11 *mill.*

Hab. Somerset (East), Cape Colony. Forest about 3000 feet above sea-level (*Col. Bowker*).

A species having very much the form and appearance of a *Succinea*. Several specimens presented to the National Collection by Colonel Bowker present but little variation in form and colour, but in some specimens the spiral grooves are much more marked than in others; in one or two they are almost confined to the penultimate and antepenultimate whorls.

Note on BULIMUS FULMINANS.

Specimens of a supposed new species of *Bulimus* from Mount Roraima, Brit. Guiana, having recently been presented by Miss Linter to the Natural History Museum, South Kensington, I was asked to give my opinion upon it, and to describe it if new. Comparing it with *B. fulminans* (Nyst), *B. blainvilleanus* (Pfr.), and *B. loveni* (Pfr.), it seemed pretty evident that if these could be properly considered as three species, the Mount Roraima one must constitute a fourth. Upon careful comparison, however, of the different forms I have come to the conclusion that they are simply geographical forms or varieties of one species. Though differing in size and form, all agree in the essential characters peculiar to the species, namely the close, regular, longitudinal striation of the upper whorls, followed upon the body-whorl by a curious rough malleation having an oblique tendency opposite to that of the striæ. The only noticeable variation is in the relative proportions of these characters; the regular striation in some specimens being confined to the upper whorls, and in others covering part of the body-whorl. We have then:—

BULIMUS FULMINANS (Nyst).

Typical form. Spire conical, rather produced; outer lip considerably thickened; longitudinal waved dark brown lines, rather conspicuous upon the lightish brown colour of the shell. The Museum specimens are from the Grota de Guacharos, near Caripè, Colombia.

Var. *blainvilleana* (*Bulimus blainvilleanus*, Pfr.). Rather larger than type, of lighter substance, shorter spire, more inflated body-whorl, darker colour with waved or zigzag markings obscure.

Hab. Taji, Prov. of Merida, Venezuela.

Var. *loveni* (*Bulimus loveni*, Pfr.). Smaller than type, of very thin substance, lightish colour, with zigzag markings conspicuous.

Hab. Venezuela.

Var. *linteræ* (Sowerby), Plate LVI. fig. 12. Smaller than type, about the size of var. *loveni*, than which it is more solid, with a more produced spire and narrower body-whorl. The zigzag markings are only faintly visible in some specimens.

Hab. Mount Roraima, British Guiana.

EXPLANATION OF PLATE LVI.

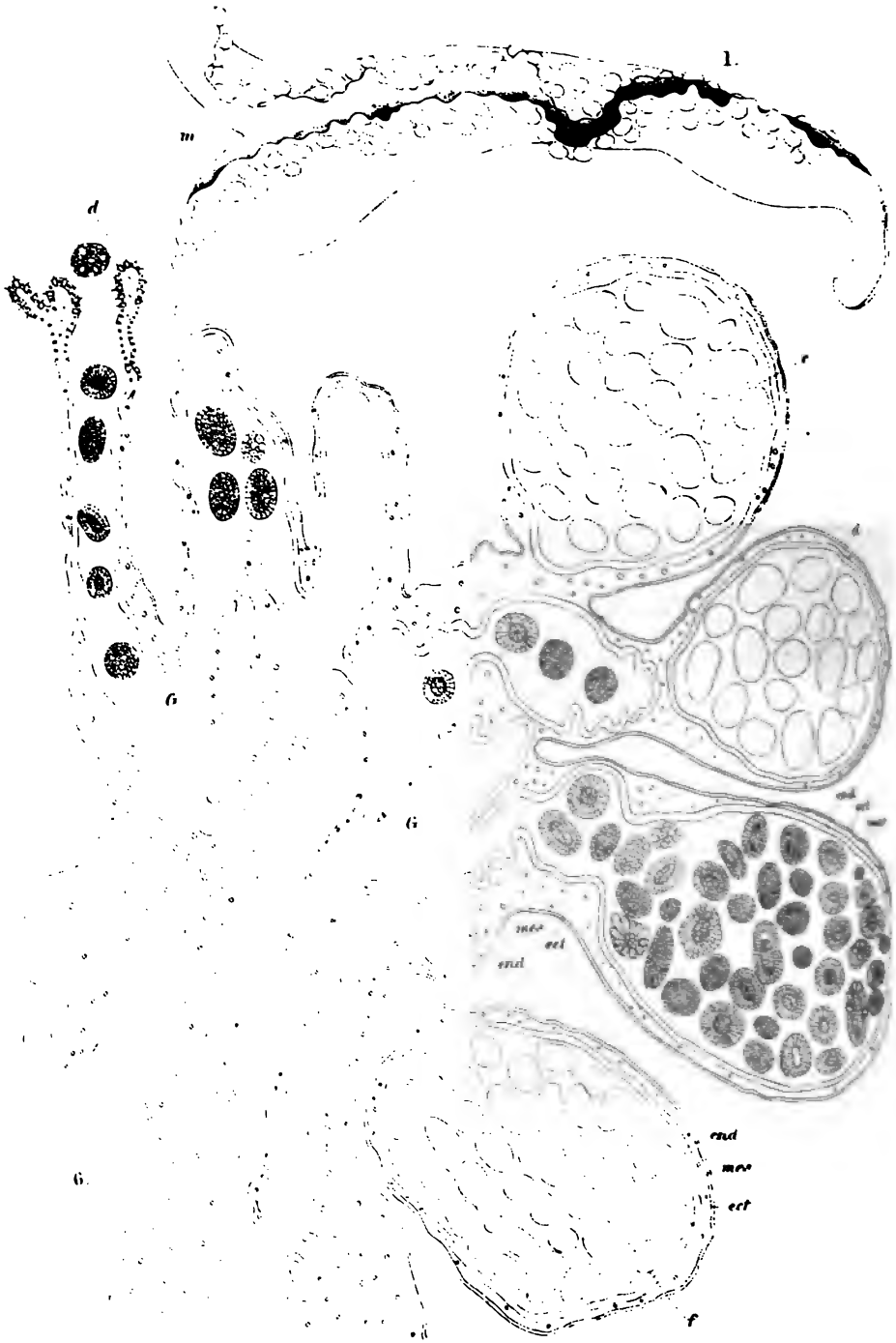
Fig. 1. *Helix* (*Geotrochus*) *horderi*, p. 577.
2. *Achatina barriana*, p. 579.
3. —— *smithi*, p. 579.
4. *Bulimus salteri*, p. 578.
5. —— (*Mesembrinus*?) *bowkeri*, p. 581.
6. *Helix* (*Corasia*) *woodfordi*, p. 578.
7. *Bulimus* (*Buliminus*?) *hanningtoni*, p. 580.
8. —— (——) *gomezi*, p. 580.
9. —— *superstriatus*, p. 578.
10. *Trochomorpha godeti*, p. 578.
11. *Achatina linteræ*, p. 580.
12. *Bulimus fulminans*, var. *linteræ*, p. 582.
13. *Leptopoma woodfordi*, p. 581.
14. *Cyclostoma hanningtoni*, p. 581.

P.Z.S. 1888. Pl. XXII.

F. A. M. del.

Mintern Bros. imp.

AURELIA AURITA.


1.
m
d
e
G
G
mes
ect
end
end
mes
ect
f
6.

[illegible]

[illegible]

5. Note on the Mode of Attachment of the Embryos to the Oral Arms of *Aurelia aurita*. By Edward A. Minchin, Keble College, Oxford.

[Received October 31, 1889.]

(Plates LVII. & LVIII.)

Some little while ago, when engaged in dissecting a series of *Aurelia aurita* in the Morphological Laboratory at Oxford, I noticed that a great number of the specimens supplied had the oral arms covered with little knobs or swellings, which, though varying greatly in size in different specimens, were always, when present, quite visible to the naked eye. I was unable at the time to obtain any information as to the meaning of these appearances, and therefore proceeded to investigate them by cutting sections of the arms. I then found that the knobs were really little stalked capsules or pouches containing embryos of *Aurelia*, formed as evaginations of the wall of the groove running down the arm, and with their lumen communicating with that of the groove through the more or less narrowed stalk. This is readily seen from the annexed figures. Fig. 1, Plate LVIII., represents an oral arm covered with the brood-capsules, drawn about three times natural size. Fig. 2, Plate LVII., represents a transverse section of an oral arm which bore no brood-capsules, in order to show the structure of the arms —namely, ectoderm (*ect.*) externally, endoderm (*end.*) lining the lumen of the groove internally, and between the two mesoglœa (*mes.*), which is very thick at the bottom of the groove. The margins of the groove are produced into numerous "digitellæ" (*d.*), finger-like processes of the ectoderm, containing a core of mesoglœa and thickly covered with nematocysts. Fig. 3, Plate LVII., represents a transverse section from an arm which bore very few, and comparatively small, brood-capsules. Two capsules are seen on the left side of the figure, one of which (*a*) is cut through its stalk, and the other (*b*) a little to one side of it. Figs. 4 and 5, Plate LVII., represent in outline two more sections from the same series through the brood-capsules *a* and *b* of figure 3, in order to show the way in which *a* becomes closed off from the groove (fig. 4) and *b* becomes bifid (fig. 5). Fig. 6, Plate LVIII., represents one side of a transverse section through an oral arm which bore numerous, and relatively very large, brood-capsules. Four of the capsules appear in the section, one of them (*e*) cut through the middle of its stalk, two others (*c* and *d*) just to one side of their respective stalks, and a fourth (*f*) so far from its stalk that it appears as if detached from the arm altogether.

From these figures it is evident that the capsules are formed as simple evaginations of the walls of the groove of the oral arm. They are hence lined by endoderm internally and ectoderm externally, with more or less mesoglœa between the two. In the smaller

capsules, such as are represented in figures 3, 4, and 5, the walls are relatively thick, containing a great deal of mesoglœa, and the capsules themselves open by a comparatively wide opening into the lumen of the groove. In the larger capsules, on the other hand (figure 6), the mesoglœa is scarcely visible, appearing as if squeezed out by the pressure of the numerous embryos contained in the capsules, and their openings are much narrowed. They always contain embryos in all stages of development, from segmenting ova to fully-formed planulæ. In the series of sections from which figures 3, 4, and 5 were drawn, several ova were found of only four or eight segments. In addition to the embryos contained in the brood-capsules, a great number are always to be found free in the bottom of the groove or lodged in the foldings of its margin.

My excuse for publishing these details is that after I had made out the structure of the pouches from my sections, I consulted the numerous works on the anatomy and embryology of *Aurelia*, and found the brood-capsules quite erroneously described by Claus and Agassiz; while in other writers I have found no mention of them at all.

Claus ('Untersuchungen über die Organisation und Entwicklung der Medusen,' Prag, 1883) writes:—"The ova pass from the ovary into the gastric cavity and through the mouth between the apposed surfaces of the arms, where, surrounded by a slimy excretory product of the endoderm (von einer schleimigen Absonderungsmasse des Entoderms umhüllt), they run through their embryonic development up to the swarming planula, as if in a brood-cavity." I find this account to be incorrect, as far as my specimens go.

Agassiz ('Contributions to the Natural History of the United States,' vol. iv.) states (pp. 14 and 15) that the embryos of *Aurelia flavidula* leave the ovary as small ciliated larvæ, either globular or oval in shape, and *with distinct inner and outer walls*[1]; in this condition they reach the pouches. In another passage (p. 58) he says:—"The ovaries .... discharge their eggs into the cavity above that floor [*i. e.* of the genital sacs], from which they have no other escape than through the channels leading into the main cavity of the body, from which they pass along the medial canals of the arms into *the pouches formed by the foldings of their margin*[1], where they undergo their first development." In figure 9 of his plate viii. he represents some of the pouches containing "eggs and planulæ." Speaking of *Cyanea*, he says:—"The eggs of *Cyanea* are able to lodge between the plications of the inner surface of the actinostome, though not provided with special pouches as in *Aurelia*." Thus Agassiz clearly recognized the fact that the embryos of *Aurelia* are carried in special pouches; but he wrongly describes their formation as foldings of the margin of the arm; and, moreover, he states that the embryos do not reach them till they have attained the planula condition. If this is the case in *Aurelia flavidula*, it certainly is not so in *A. aurita*. I have succeeded in finding in the pouches embryos in all the stages described and figured by Claus

[1] The italics are not Agassiz's.

(*loc. cit.*), from segmenting ova to the fully formed planulæ or "clistogastrulæ."

Other Medusæ belonging to the Acraspeda carry their ova about during the first stages of development. Von Lendenfeld states (Proc. Linn. Soc. N. S. Wales, vol. ix.) that in *Pseudorhiza* "the embryos are carried about in pouches suspended in great number from the radial canals which run centripetally from the ring-canal. They remain there till they are fit to turn into young Scyphistomes." In *Stylorhiza* (*Phyllorhiza*) *punctata*, he says (*loc. cit.*), "the young embryos adhere to the mother's filaments until they have nearly attained the *Scyphistoma* stage." The same author describes ('Zeitschrift für wiss. Zoologie,' 1888, p. 301) in *Cyanea anaskala* and *Phyllorhiza punctata* a peculiar arrangement of filaments on the underside of the arms, by which the embryos appear to be nourished.

P.S., Dec. 9, 1889.—Since writing this article my attention has been directed to Ehrenberg's paper, "Ueber die Akalephen des rothen Meeres und den Organismus der Medusen der Ostsee" (Phys. Abhandl. Akad. Berlin, 1835). Ehrenberg gives a rough figure of *Aurelia aurita* showing a magnified external view of the pouches and their contained embryos (Taf. viii. fig. 1, and Taf. iii. fig. 1); and states (p. 197), first, that the brood-pouches are either formed by the pressure of the "Kugeln" (*i. e.* ova and embryos) which collect in the groove of the arms, or else are preformed by the mother for their reception; secondly, that the pouches increase in size as more embryos crowd in; and thirdly, that when the embryos quit the pouches the latter collapse and disappear.

EXPLANATION OF PLATES LVII. & LVIII.

In all the figures *ect* denotes the ectoderm; *mes*, the mesoglœa; *end*, the endoderm; *d*, digitellæ; and the letter G is placed in the lumen of the groove of the arms.

Fig. 1. An oral arm of *Aurelia aurita*, covered with the little pouches containing embryos. The letter *m* is placed in the cavity of the mouth.

2. A transverse section of an oral arm which was entirely without brood-pouches. The numerous plications are due to the arm having been crumpled while preserved in spirit.

3. A transverse section of an arm which had few and somewhat small pouches. *a* and *b*, two of the pouches containing embryos.

4 & 5. Two more sections through the pouches lettered *a* and *b* in the last figure.

6. A transverse section through an arm which had numerous and very large brood-pouches. Only one side of the section is drawn. *c*, *d*, *e*, and *f*, four pouches, each containing a great number of embryos, those in *c*, *d*, and *f* being only represented in outline.

December 3, 1889.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1889 :—

The total number of registered additions to the Society's Menagerie during the month of November was 83, of which 30 were by presentation, 3 by birth, 38 by purchase, 5 by exchange, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 86.

The following extract was read from a letter received by the Secretary from the Rev. G. H. R. Fisk, C.M.Z.S., dated Cape Town, Sept. 24, 1889 :—

"From time to time I have read with interest that which has appeared in the Society's 'Proceedings' concerning *Bipalium kewense*[1]. Last year I found about my place at Rondebosch several specimens apparently of this creature, some of which I gave to the Museum. This winter I have found other specimens, some of which were very fine ones. I placed in a glass jar some earth and living moss and added water. In this I have, during the last six months, kept my specimens of *Bipalium*. I have covered the top of the jar with fine wire gauze, and placed it on the floor in a dark corner of a room under the folds of a window curtain. Some of the large specimens of *Bipalium* have disappeared, but I find that there are in the jar several young ones in a healthy state, which glide over the sides of the jar, where I see them during the very early hours of the morning. Those which I placed in the jar have either bred or multiplied by division."

Mr. Henry Seebohm, F.Z.S., exhibited a small collection of Birds selected from a series obtained during the present year by Mr. Holst on the Bonin Islands. Amongst them were specimens of the following species :—

Hapalopteron familiare.
Fringilla kittlitzi, sp. nov.
Cettia diphone.
Hypsipetes squamiceps.
Carpophaga versicolor.
Œstrelata hypoleuca.
Nycticorax crassirostris.

Mr. Seebohm also exhibited a pair of *Merula celænops* from Fatsirio Island.

Mr. Sclater exhibited a specimen of the egg of the Crested Screamer (*Chauna chavaria*), from the collection of Mr. J. J.

[1] See P. Z. S. 1886, p. 166; 1887, p. 548; 1889, p. 5.

Dalgleish, and pointed out its resemblance to that of the Geese (*Anser*). The egg was one of a clutch of four taken in October, 1873, by Mr. E. Gibson (as described, 'Ibis,' 1880, p. 166) near Cape San Antonio, Buenos Ayres.

The following papers were read :—

1. Contributions to the Anatomy of Picarian Birds.—Part I. On some Points in the Structure of the Hornbills. By Frank E. Beddard, M.A., F.R.S.E., &c.

[Received October 5, 1889.]

Under the above heading I propose to offer to the Society a series of notes upon the structure of Picarian birds which may form a parallel series to the valuable communications upon Passerine birds by Prof. Garrod and Mr. Forbes published in the 'Proceedings' of this Society.

The anatomy of the soft parts of the Hornbills has not been much studied, excepting as regards those points which were made use of by Garrod in his scheme of Bird-Classification; further details are, however, to be found in Gadow's work upon Birds [1], and in Max Fürbringer's recently published monograph upon the shoulder-girdle and muscles of Birds [2].

Visceral Anatomy.

The *liver*-lobes present some differences in different Hornbills.

Commencing with *Bucorvus abyssinicus*, in which the right lobe is larger than the left, the series terminates with *Buceros coronatus*, in which the left lobe is larger than the right. The following table shows the relations of the liver-lobes in such Hornbills as have been examined [3].

Bucorvus abyssinicus.	R > L.
Aceros nipalensis.	R > L.
Buceros bicornis.	R > L.
Sphagolobus atratus.	R > L.
Bycanistes subcylindricus.	R > L.
Buceros plicatus.	R = L.
Buceros rhinoceros.	R = L.
Buceros coronatus.	R < L.

I have noticed a peculiarity in several species of Hornbills which is not found in all other birds. In all birds the two lobes of the liver are completely separated from each other by the umbilical ligament, which bears the umbilical vein (this appeared to be particularly large and well developed in all Hornbills which have

[1] Bronn's 'Klassen und Ordnungen des Thierreichs,' Bd. vi.

[2] 'Untersuchungen zur Morphologie und Systematik der Vögel.'

[3] The greater part of these observations are to be found in MS. notes of Garrod and Forbes.

been dissected by me); and in addition one liver-lobe—the right—is commonly separated from the abdomen by a thin membranous septum. In Hornbills both lobes of the liver are thus shut off; I have figured this condition in *Bucorvus abyssinicus*[1]; it is exactly the same in one or two other species which I have subsequently studied. This condition is, so far as my experience goes, rare in birds; since, however, I propose later to bring forward some facts relative to the arrangement of the viscera and the partition of the cœlom in birds, I only dwell upon this character now as tending to separate the Bucerotidæ from most of their allies.

Syrinx.

Aceros nipalensis.—The last rings of the trachea are fused together to form a solid box, at the sides of which, however, the individual rings are recognizable. In front the last three rings are thus fused, but behind two additional rings fuse with the others to form a wide and deep bony plate. The tracheal rings lying in front of these five show the dovetailing arrangement which is so often found in the tracheal rings. The pessulus is well developed and bony, but owing to the complete fusion of the tracheal rings both posteriorly and anteriorly it is impossible to say from which rings it is developed.

The intrinsic muscles of the syrinx are attached near to the boundary-line between the last and the penultimate tracheal rings.

The bronchial semirings are cartilaginous, and there is a considerable interval between the first of these and the last tracheal ring.

Bucorvus abyssinicus.—The syrinx of this Hornbill (fig. 1, p. 589) differs in many particulars from the last. The tracheal rings are not ossified, and there is no box formed by their fusion. Only posteriorly are the penultimate ring and the two in front of this fused just at the origin of the pessulus; anteriorly the pessulus is fused with the antepenultimate tracheal ring, which forms with it a three-way piece; the last two tracheal rings do not meet in front. The slender syringeal muscles are attached to the anterior margin of the last tracheal ring.

The peculiar shaped tracheal rings are hardly recognizable until about the 14th from the end.

Buceros rhinoceros (fig. 2, p. 589) has a syrinx which is not very different from that of *Aceros*. The same rings are fused to form an ossified box; but the fusion between the several rings is hardly so extensive as in *Aceros*; furthermore the syringeal muscles are attached to the posterior border of the last tracheal ring.

In *Sphagolobus atratus* there is very little fusion between any of the last tracheal rings; the last three rings, which alone show any signs of ossification, are fused for a very short space anteriorly; posteriorly there is no fusion at all, and the pessulus can be plainly

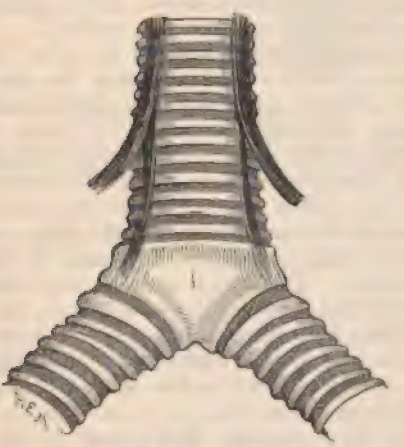
[1] "Notes on the Visceral Anatomy of Birds.—I. On the so-called Omentum." P. Z. S. 1885, p. 842, woodcut, fig. 2, L.

seen to be connected with the antepenultimate ring. Although the last tracheal rings are not fused, they are very closely applied together and no membranous interspaces are left.

Fig. 1.

Syrinx of *Bucorvus abyssinicus*. Front view.

Fig. 2.



Syrinx of *Buceros rhinoceros*. Front view.

Ceratogymna elata, which is, like the last, a comparatively small species, has a very similar syrinx; indeed I can find no differences sufficiently tangible to be described.

Buceros lunatus and *B. bicornis*, which are both large species, hardly present any differences from *B. rhinoceros*.

Bycanistes subcylindricus has a syrinx which, although of about the same size as that of *Ceratogymna elata*, shows certain differences which are worth putting on record. In the first place, the syrinx is much compressed from side to side at the level of the last tracheal ring; in the second place, the last tracheal ring is very much more arched than usual; it forms indeed almost a complete semicircle. The intrinsic muscle of the syrinx in this, as in the other smaller Hornbills, is very much larger relatively than in the larger species.

Anthraceros malayanus, again, is a little different from all the types hitherto described. The last tracheal rings are but little fused posteriorly, only the penultimate and antepenultimate rings are so fused, so that it is impossible to be certain as to the origin of the pessulus. The intrinsic muscles are slender.

Toccus presents certain peculiarities which I have not yet observed in any other Hornbills; the trachea has *two pairs* of extrinsic muscles given off about ½ an inch apart. This condition seems to me to be so remarkable that I have preserved the specimen which shows it, though unfortunately the insertions of the anterior pair of muscles are lost and I have no recollection of where the point of insertion was. The intrinsic muscles are relatively small. There appears to be no fusion between any of the tracheal rings.

Myology.

The arrangement of the semitendinosus and adductor in *Aceros nipalensis*, which is somewhat complex, will be understood from the accompanying drawing (woodcut, fig. 3, p. 591).

The *semitendinosus* (*St*) is inserted on to the tibia by a long thin flat tendon; another tendon joining the first just where it passes into the muscle is attached to the *gastrocnemius*.

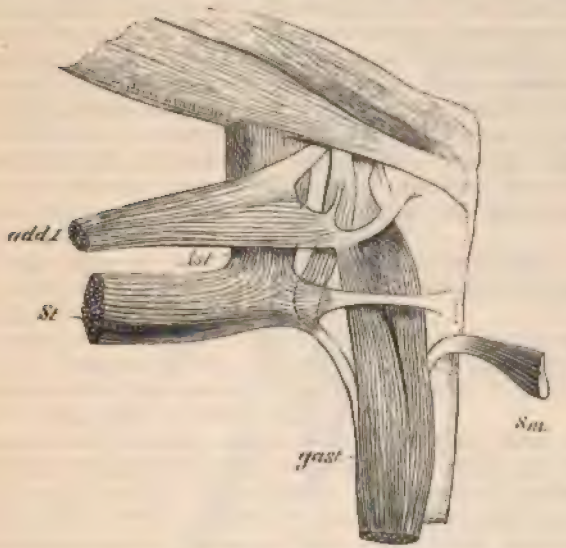
The *accessory semitendinosus* is in two parts: the larger half (*Ast*) is attached to the semitendinosus just behind the origin of the tendon of insertion of the latter; the second half appears to arise from the tendon which connects the semitendinosus with the gastrocnemius, it passes up towards the thigh, and just in front of its (tendinous) insertion on to the femur it receives a tendon from the adductor. This latter muscle (the *adductor longus*) is inserted by three tendons:—(1) to the femur; (2) a small tendon which has already been described as joining the second half of the accessory tendinosus; and (3) near to the origin of one of the internal heads of the gastrocnemius; to this tendon is also attached the inner head of the gastrocnemius.

The corresponding muscles[1] of *Bucorvus abyssinicus* are rather simpler than in *Aceros nipalensis*. The *adductor longus* is only inserted at two places: first by a fleshy insertion along a considerable length of the lower border of the femur; second by a tendon in

[1] Gadow figures most of these muscles in Bronn's 'Thierreichs,' Aves, Bd. vi. Abth. iv. Taf. xxiii. *b*. fig. 1.

common with the innermost head of the gastrocnemius. The *semitendinosus* is attached by a thin tendon to the tibia as in *Aceros* and by a short tendon, also as in that species, to the gastrocnemius. The *accessory semitendinosus* arises chiefly from this latter tendon, but there is no division between this part of the muscle and that which takes its origin from the fleshy part of the semitendinosus.

Fig. 3.



Leg-muscles of *Aceros nipalensis*.

add, Adductor longus; *Ast*, accessory semitendinosus; *St*, semitendinosus; *gast*, gastrocnemius; *Sm*, semimembranosus.

In *Buceros atratus* there is again some little difference from both the types already described, although the resemblances are on the whole closer to *Aceros*.

The *adductor longus* is attached by two tendinous heads; the upper one of these, as in *Aceros*, is attached to the lower border of the femur; this corresponds to the fleshy insertion of the muscle in *Bucorvus*; the lower tendon is fused on its way with the inner head of the gastrocnemius, which is continued upwards and reaches the femur, and then bifurcates into two tendons of insertion. The relations of the semitendinosus and of the accessory semitendinosus are as in *Aceros nipalensis*.

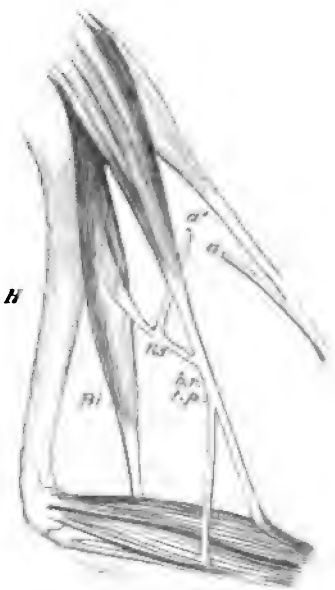
In *Toccus* these muscles are much the same as in *Buceros*.

In *Ceratogymna elata* I find a closer resemblance to *Aceros* than to any other of the genera mentioned in this paper, but there is an

agreement with *Bucorvus* in the *fleshy* insertion of the *adductor longus* on to the lower border of the femur. The *accessory semitendinosus* is distinctly double as in *Aceros* and is attached by a short tendon to the adductor, though the direction of this tendon is somewhat different to what is found in *Aceros*.

The *patagial muscles* of *Bucorvus* (fig. 4) are particularly interesting; as in other Hornbills, the tendon of each just at its commencement is reinforced by a tendinous slip derived from the pectoralis primus; in *Bucorvus* there is in addition a tendinous slip from the biceps.

Fig. 4.



Patagial muscles of *Bucorvus abyssinicus*.

H, Humerus; *Bi*, Biceps; *t.p*, *b.r*, tendon of *tensor patagii brevis*; *a'*, tendinous slip to *pectoralis primus*; *Bs*, junction of this with a tendinous slip to *biceps*; *a*, tendinous slip which unites tendon of *tensor patagii longus* with *pectoralis*.

The fact that this slip is attached *not* to the *tensor longus* but to the *tensor brevis* does not in my opinion invalidate its homology with the so-called "biceps slip" of other birds. *Bucorvus* is moreover not the only "Anomalogonatous" bird with a biceps slip; these structures I have found in *Colius* as a well-developed fleshy muscle united to the tendon of the *tensor longus*; but its description by Prof. Fürbringer [1] has anticipated the novelty of the present remarks.

[1] Untersuchungen zur Morph. u. System. der Vögel, &c. vol. i. p. 529.

Bucorvus possesses a femoral caudal muscle, which was stated by Garrod to be absent [1], but is described and figured by Gadow [2].

In *Aceros* the head of the anconeus is single; it is double in *Bucorvus* and *Buceros*.

I do not attempt in the present paper to discuss in detail the affinities of the Hornbills to other Picarian birds, as material hardly exists at present for comparison. The only birds to which they might be supposed to be allied, and to which they show a particular resemblance in any well-marked character, are the Colies and Caprimulgidæ; the presence of the ligament uniting the biceps to the tensor patagii in *Bucorvus* is no doubt the representative of the muscular slip existing in the former groups. With regard to the Caprimulgidæ, these birds probably, in spite of the resemblance noted above, would not be regarded by many ornithologists as coming anywhere near the Hornbills. I may remark, however, that *Podargus* has the same great development of muscular fibres in the horizontal septum attached to the gizzard that has been recorded above in the Hornbills.

The main object of this paper is to endeavour to fix some of the generic types, about the limits of which the most diverse opinions have been held.

To mention a few of these:—Elliot, in his illustrated monograph [3] of the Family, allows no less than 19 distinct genera; Dubois [4] considers that there are only four genera of Hornbills, while G. R. Gray [5] only admits two, *Bucorvus* and *Buceros*.

There can be no doubt whatever that *Bucorvus* forms a very distinct type of Hornbills, even in its habits. Although it does not differ from the other Bucerotidæ in the absence of the femoro-caudal muscle as Garrod believed it did, *Bucorvus* exhibits a larger number of structural differences from other forms than any of these do from each other. The peculiarities of the carotid arteries [6], the structure of the syrinx (see p. 588), and the presence of a tendinous "biceps slip" mark out *Bucorvus* as far removed from other Bucerotidæ. With regard to the other Hornbills it is not so easy to mark out a number of distinct genera.

The form of the syrinx in *Bycanistes* is peculiar, and, as far as my observations go, restricted to this genus; but unfortunately I am not in a position to add any other differential characters. It will be remembered, however, that the species which constitute the genus *Bycanistes* are African and do not extend into the Oriental Region; there is thus some further support given to the view that

[1] *Loc. cit.* [2] *Loc. cit.*

[3] A Monograph of the Bucerotidæ. London, 1877–82.

[4] "Revue critique des Oiseaux de la Famille des Bucerotides," Bull. Mus. d'Hist. nat. de Belgique, t. iii. (1884–5), p. 187.

[5] Hand-list, p. 127.

[6] "On a peculiarity in the Carotid Arteries, and other points in the Anatomy of the Ground Hornbill (*Bucorvus abyssinicus*)," P. Z. S. 1876, p. 60, and Coll. Papers, p. 316. W. Ottley, "A Description of the Vessels of the Neck and Head in the Ground Hornbill," P. Z. S. 1879, p. 461.

this group of Hornbills may be regarded as a distinct generic type—*Bycanistes*. I am also inclined to think that *Toccus* is a distinct genus; it may be that the African forms are really distinct from the Asiatic; but this is a matter that requires further study.

Col. Tickell[1] has separated *Aceros* and those Hornbills such as *Toccus* which are without casques from the other Indian Hornbills, and has remarked that the two genera, which he terms *Aceros* and *Buceros* respectively, have a different mode of flight.

Aceros, however, in my opinion should not be generically separated from *Buceros*, the anatomical differences between the two genera being so extremely slight.

Ceratogymna and *Sphagolobus* have a syrinx which differs in the non-fusion of the last tracheal rings from the syrinx of *Buceros* and particularly of *Aceros*, where the fusion between these rings is greater than I have observed in any other Hornbill. But this peculiarity, as also in the case of *Toccus* and *Bycanistes*, is correlated perhaps with the small size of the birds.

2. On the Anatomy of Burmeister's Cariama (*Chunga burmeisteri*). By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received October 31, 1889.]

Introductory.

The specimen which forms the subject of the present paper was acquired by the Society in 1887 and died in 1888, being the fifth example[2] which the Society has obtained.

The bird itself was discovered only thirty years ago (in 1859) by Dr. Burmeister, and was first described by Dr. Hartlaub[3] in the 'Proceedings' of this Society. This description is confined to the external characters, and to an interesting account, from Dr. Burmeister's notes, of the habits of the bird. It is considered by Hartlaub to present differences of subgeneric value from *Cariama cristata*. Reichenbach afterwards[4] placed it in a separate genus, a proceeding which is approved of by Mr. Sclater[5]. A figure of the bird[6] illustrates Mr. Sclater's note which has just been referred to.

Later Dr. Burmeister[7] gave a somewhat fuller account of its external characters, agreeing with Reichenbach in distinguishing it generically.

Dr. Gadow has given[8] some account of the visceral anatomy of

[1] Birds of India (MS.); this work is in the Society's Library.
[2] Sclater, P. Z. S. 1887, p. 319.
[3] "On a new form of Grallatorial Bird nearly allied to the Cariama (*Dicholophus cristatus*)," P. Z. S. 1860, pp. 335–6.
[4] Die vollständigste Naturgeschichte der Tauben, etc. p. 159.
[5] P. Z. S. 1870, p. 666.
[6] *Loc. cit.* pl. xxxvi.
[7] Reise durch die La Plata-Staaten, Bd. ii. p. 506.
[8] Journ. f. Ornith. Jahrg. xxiv. (1876) pp. 445–6.

the two Seriemas; there appears, from what he says, to be no difference between the two species, but his account is a very brief one and confined to the principal characters; so far as it goes my own observations are quite confirmatory of Gadow's paper. The bird is regarded by Gadow as near to *Otis* and *Grus*; this view is still retained [1] by Dr. Gadow. The osteology and visceral anatomy of *Cariama cristata* have been worked out by Burmeister [2]. In the course of the following remarks upon the osteology of *Chunga*, which is compared with that of *Cariama*, I do not refer in detail to Burmeister's description of the bones; as to the visceral anatomy I have not much to add to Burmeister's description. *Cariama* is regarded by Burmeister as forming with *Psophia* a special group closely allied to Cranes and more remotely to *Otis* and the Rails; the presumed affinities with *Gypogeranus* are quite superficial. Burmeister's views of the affinities of the bird are based upon visceral as well as osteological characters, and I propose later on to examine this matter in connection with *Psophia*, the anatomy of which I am at present studying. I do not enter in this paper into the affinities of *Chunga* and *Cariama*; I merely attempt to differentiate the two genera and to show that they are to be distinguished by well-marked osteological characters, although in the visceral and muscular anatomy they are very similar.

Osteology.

The skull of *Chunga* (fig. 1, p. 596) is decidedly narrower in the orbital region than that of *Cariama* (*ibid.* fig. 2).

The lachrymal bones project further out from the skull; in *Cariama* the distal region of each of these bones is bent sharply down and comes to lie at right angles; in *Chunga* the corresponding bones are only gently curved and therefore appear to have a relation to the skull different from that of *Cariama*.

On the under surface of the skull several well-marked differences between the two types are recognizable.

The *palatines* in *Chunga* have a nearly straight posterior margin, which lies therefore in a direction nearly at right angles with the lateral margins of the bone.

In *Cariama* the angle formed by the external lateral and the posterior margins of the bones is greater; that is to say, the posterior margin of the palatine bone does not coincide so nearly with the direction of the transverse axis of the skull as it does in *Chunga*.

The *maxillo-palatines* of *Chunga* extend further forwards than in *Cariama* and each narrows gradually towards its anterior extremity; in *Cariama*, on the contrary, these bones show a greater deficiency in ossification anteriorly, and so come to be somewhat abruptly

[1] "On the Taxonomic Value of the Intestinal Convolutions in Birds," P. Z. S. 1889, p. 303.

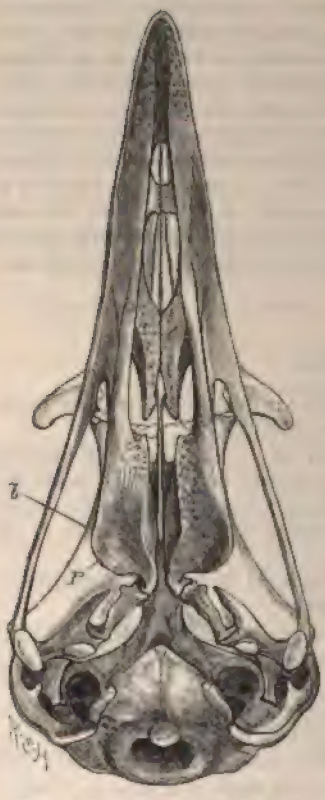
[2] "Beiträge zur Naturgeschichte der Seriema," Abh. nat. Ges. Halle, i. (1854) p. 17.

truncated. These bones are also less spongy and altogether more solid in *Chunga*.

The number of vertebræ and their distribution appear to be identical in the two types.

The first *rib*, although still rudimentary, is much larger in *Cariama*,

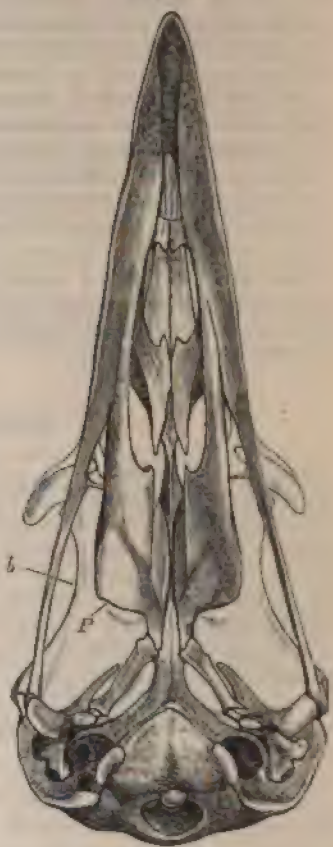
Fig. 1.



Chunga burmeisteri. Skull, under surface.

P, palatines; *b*, supraorbital ridge.

Fig. 2.



Cariama cristata. Skull, under surface.

Lettering as in fig. 1.

and the 3rd to 5th and 6th ribs have strong hooked uncinate processes; the sternal rib of the 3rd rib (the first complete rib) is as strong in proportion as are the following sternal portions. There is no rudimentary rib behind the 7th (see fig. 4, p. 599).

In *Chunga* (fig. 3, p. 598) there are differences in all the points just enumerated. The first rib is very rudimentary; only ribs 4, 5, and 6 (*i. e.* one less than in *Cariama*) are furnished with uncinate processes, which are straight, directed upwards and backwards, and not curved; the sternal half of the first complete rib is slender. There is a rudimentary 8th rib on each side; on the left side of the body it consists of a curved piece continuous below with the sternal portion of the 7th rib; on the right side a shorter piece lies along the posterior border of the sternal half but not fused with it; there is also a small rudiment of a vertebral rib attached to the transverse process of the 8th dorsal vertebra.

The proportion between the length (from point to point) of the lateral margin of the sternum and the length of the space occupied by the attachment of the sternal ribs is:—

in *Cariama*, 2·4 : 1·35,
in *Chunga*, 2·5 : 1·15,

showing that in the latter genus the attachments of the ribs are more crowded together than in the former; at the same time the first sternal rib is attached much nearer to the anterior lateral process of the sternum in *Chunga* than it is in *Cariama*. The sternal rostrum is more developed in the latter type, and there is a difference in the shape of the sterna on a lateral view which will be more easily appreciated by an inspection of the accompanying woodcuts (figs. 3, 4) than by a description.

In the *pelvis* (see figs. 5, 6, pp. 600, 601) the chief differences are, firstly, that the ilia extend rather further forwards in *Cariama*, very nearly reaching the last rib but one; in *Chunga* the anterior extremities of the ilia only just get beyond the seventh rib. Secondly, the line of junction of the transverse processes of the lumbar vertebræ with the border of the first acetabular ilium forms a straight line; in *Chunga* the corresponding line is curved. The breadth of the pelvis is greater in *Chunga*, the proportion between length and breadth in the two types being as follows:—

	Length of pelvis.	Breadth.
	in.	in.
Chunga	2·95	1·6
Cariama....	3·25	1·6

These measurements of breadth are taken from the extremities of the post-trochanteric processes, which are well marked in both these birds, but perhaps if anything rather more marked in *Chunga*. If these measurements had been made between the antitrochanteric processes, the contrast between the two types in the proportions between length and breadth of the pelvis would have been greater than is indicated in the above table; these processes are more strongly developed and project further out in *Chunga* than they do in *Cariama*.

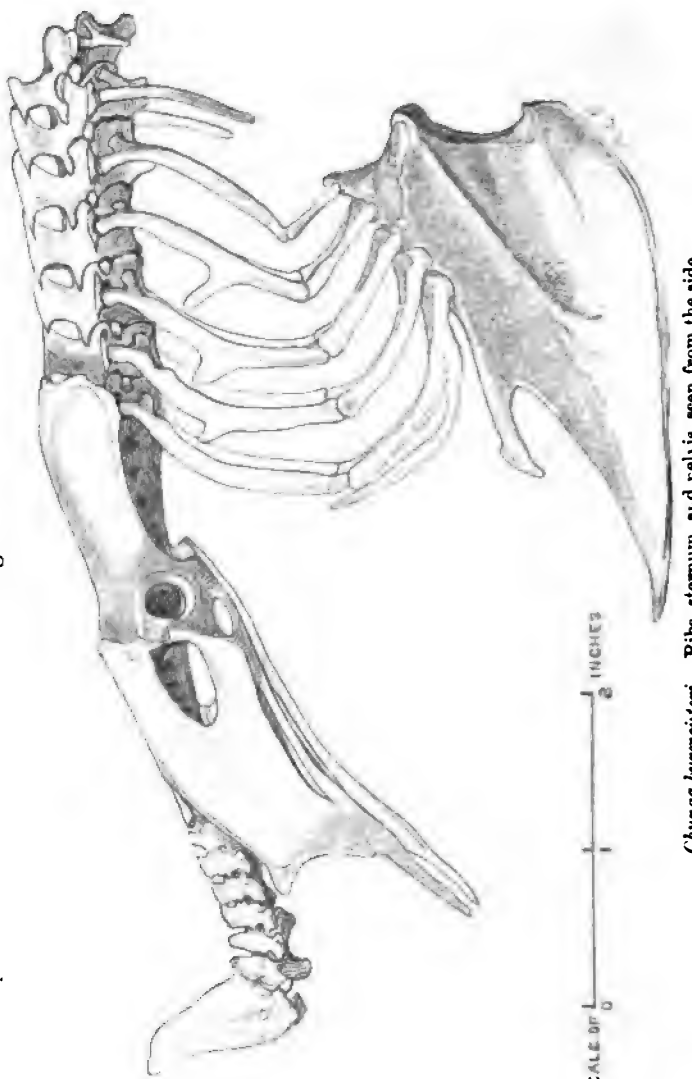
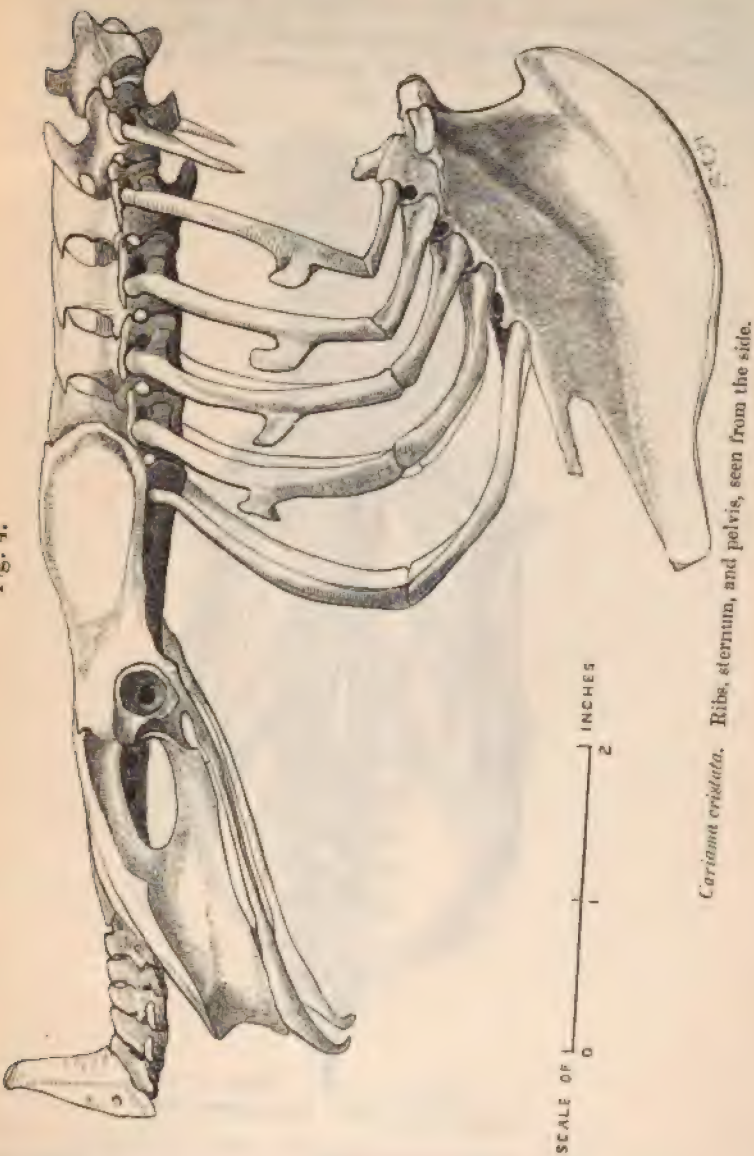


Fig. 3.

Chunga burmeisteri. Ribs, sternum, and pelvis, seen from the side.

Fig. 4.

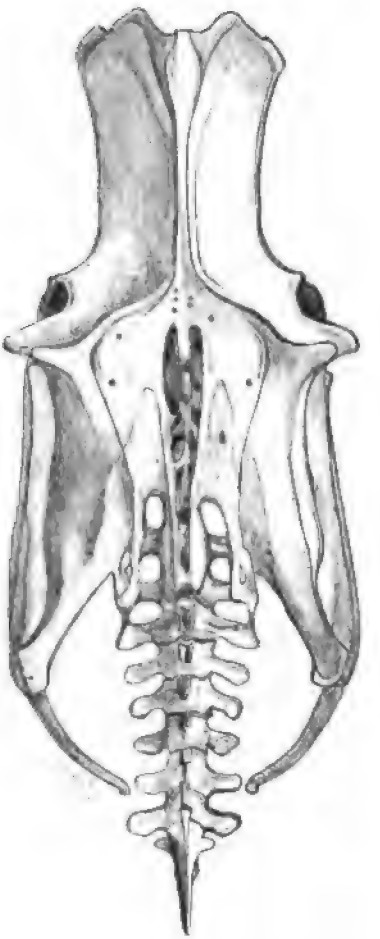


Cariama cristata. Ribs, sternum, and pelvis, seen from the side.

Pterylosis, Myology, and Visceral Anatomy.

The pterylosis of *Chunga* does not differ in any points from that of *Cariama*. The *oil-gland* was quite nude with a long duct.

Fig. 5.

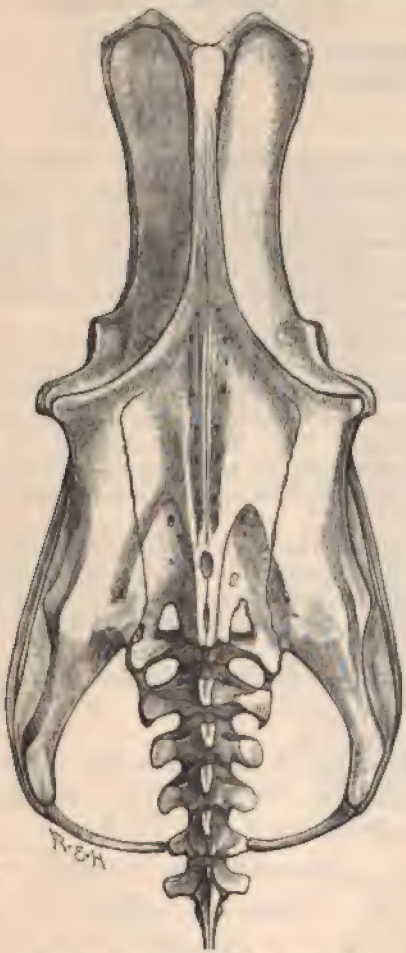


Chunga burmeisteri. Pelvis, dorsal view.

Comparing the viscera generally with Burmeister's description and figures of *Cariama*, I do not find any points of difference between the two.

I may remark, however, that in *Chunga*[1] there are considerable traces of the right aortic arch in the shape of a fibrous band attached to the aorta just in front of origin of the cœliac axis. This may

Fig. 6.



Cariama cristata. Pelvis, dorsal view.

perhaps be regarded as a point of resemblance with the Accipitres: it is true that in other birds besides the Accipitres the ligament

[1] I have not had an opportunity of finding out whether *Cariama* shows the same structure.

corresponding to the right aortic arch is present; but its presence is found in so many Accipitres that it is highly characteristic of them.

I quote from MS. of Garrod the following measurements of the various parts of the alimentary tract to show how close is the resemblance between the two:—

	Cariama.	*Chunga.*
	in.	in.
Small intestine	33	33
Large intestine	3	3·5
Cæca.....	8·75	{ 10·5 / 8·5

The *expansor secundariorum* is as in *Chauna* and *Cariama*. There is no *biceps slip* to patagial tendon as in *Cariama*. The *anconeus* has an accessory flat tendon attaching it to humerus.

The *pectoral muscle* arises from the whole of the sternum, which is free from the origin of the second pectoral; it also arises from the aponeurosis of the second pectoral. It is partially divided by a septum into two muscles.

The *tensores patagii brevis* and *longus* appear to form one muscle at their origin; this muscle receives a tendon from deltoid ridge of humerus. The tendon of *brevis* is very large and flattened out, but as it is accurately figured by Fürbringer[1] I do not describe it more fully. A drawing of Prof. Garrod's shows that in *Cariama* the *tensor brevis tendon* is similar, and he particularly states that there is no *biceps* slip; neither Fürbringer nor myself have found a biceps slip in *Chunga*.

The *accessory femoro-caudal* is present in *Cariama*, and it is stated by Garrod in a MS. note to be missing in *Chunga*; however, I found this muscle in the specimen dissected by me; it was thin and slender, and became tendinous in the middle between its origin and insertion.

The *biceps brachii* in *Chunga* is bifid at its insertion.

3. On the Relations of the Fat-bodies of the Sauropsida. By Gerard W. Butler, B.A. (Communicated by Prof. G. B. Howes, F.L.S., F.Z.S.)

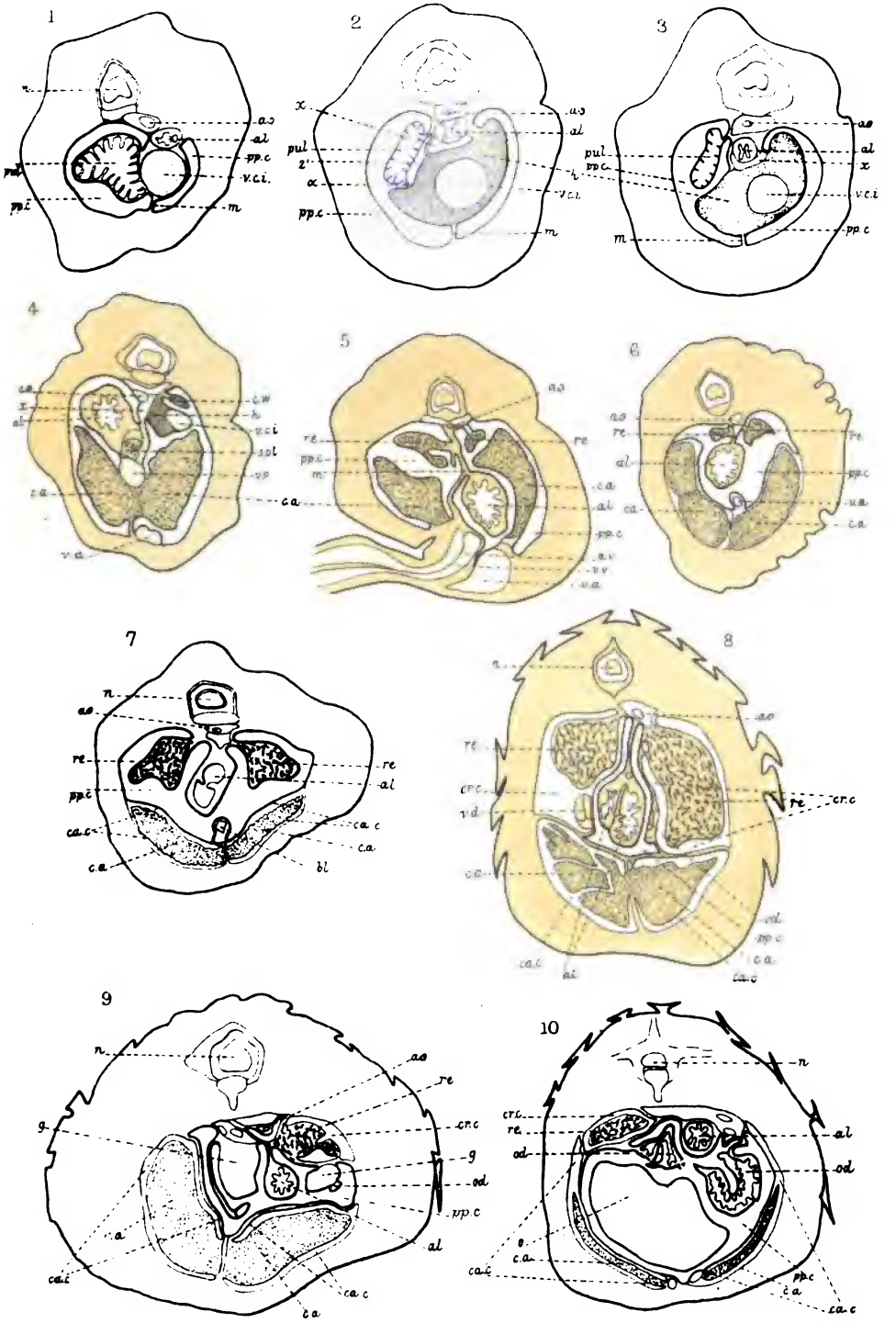
[Received November 26, 1889.]

(Plates LIX. & LX.)

Contents.

	Page
I. Introductory	603
II. On the Relations of the Fat-bodies of the Sauropsida, and on certain points in the Anatomy of Monitors	603
III. Subperitoneal Fat of Mammals	608
IV. Some Remarks on the Function of the Subperitoneal Fat-bodies of the Sauropsida	609

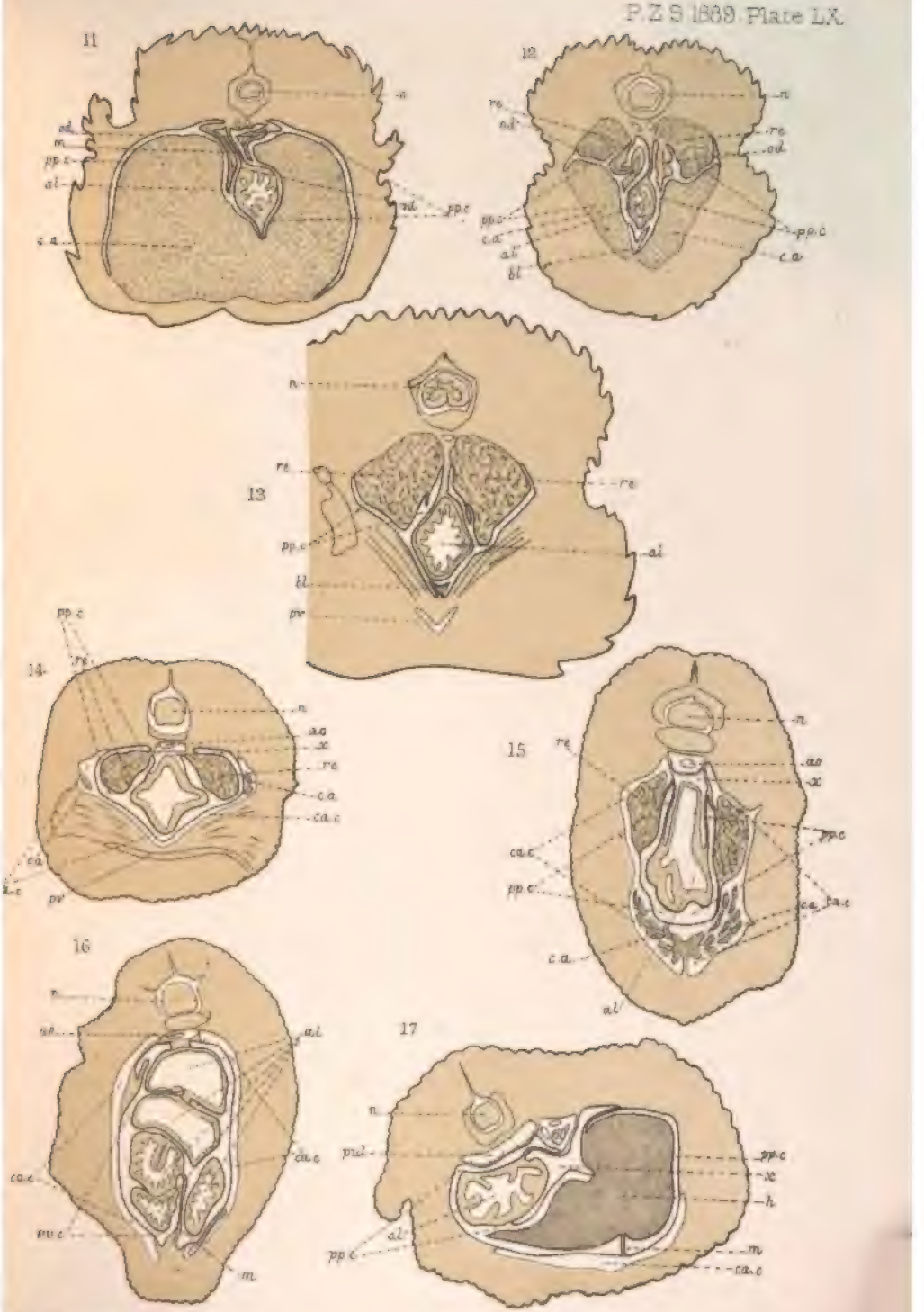
[1] Untersuchungen z. Morph. u. Syst. Vögel, Taf. xx. fig. 9.



G.W.Butler del. et lith.
M.Parker lith.

West, Newman imp.

Fat bodies in the Sauropsida.



Fat bodies in the Sauropsida.

Page
V. On certain Subcutaneous Fat-deposits 609
VI. On the fatty "Spleen" of the Crocodiles..... 610
VII. Conclusions..... 611
VIII. Explanation of the Plates..... 612

I. Introductory.

The conditions under which the investigations of which this paper gives the results were commenced and carried on were stated in the introduction to my paper upon the Subdivision of the Body-cavity, read at the last meeting (see above, p. 452).

II. On the Relations of the Fat-bodies of the Sauropsida, and on certain Points in the Anatomy of Monitors.

The fat-bodies referred to are those which, as is well known, occur in Lizards on the course of the "pelvic" veins, and of more or less of the anterior-abdominal vein. The vessels named, with their tributaries, take away the blood, which is brought to the fat-bodies by large branches from the anterior of the two pairs of arteries that supply the hind limbs, and which I take to be homologous with the femoral arteries of birds.

Corresponding fat-bodies are very conspicuous in the Snakes (*cf.* figs. 8, 9, & 10 *c.a*), where, as in the Snake-like Amphisbænidæ, they extend from the cloaca to the hinder margin of the liver (*cf.* figs. 4, 5, 6, 7). The figures of sections of Adder and embryo Grass-Snake show that, when the fat is well developed, the peritoneal cavity of Snakes may be much restricted by reason of the fact that the kidneys and fat-bodies lie outside it. The latter occur in the Crocodiles, but, as described below, the fat-bodies here referred to are in these animals more lateral in position than in Lizards; and in the case of the birds, the fat-laden "omentum," or transversely expanded ventral ligament of the stomach, is, I think, obviously comparable, so far as its fat is concerned, to the similar fat-laden ventral ligament in such forms as the Amphisbænidæ and Snakes, where the fat extends forwards as far as the liver.

The Chelonia are the only order of the Sauropsida in which I have not observed these structures well developed, but there appear to be traces of them in *Emys europæa*[1].

In many Lizards (*cf.* fig. 11) these fat-bodies, pushing the peritoneum before them, bulge into the body-cavity; and, lying on the course of the large vessels ventral to the (once respiratory allantoic) bladder (*cf.* figs. 7 & 12) and the alimentary canal, into the ventral ligament of which they in some forms (Amphisbænidæ, fig. 4) obviously extend, they may form paired masses quite as conspicuous in the posterior part of the abdominal cavity as are the liver-lobes in the anterior half[2].

[1] I have only examined in this connection some half-dozen specimens of *Emys* and *Testudo*, and those not large ones.

[2] These lie, of course, ventral to the alimentary canal and lungs. Passing over the important difference that no branching system of tubules extends from

The extent to which these fat-bodies project into the body-cavity varies, and that in a manner not merely dependent upon their size, but also, so to speak, upon the ease with which the peritoneum separates from the body-wall. In such a Lizard as *Tupinambis teguexin* I have seen the fat-bodies projecting forwards into the peritoneal cavity as two yellow lobes, as large as the liver-lobes; and this may be seen usually to a lesser degree in the common Green Lizard and in others. On the other hand, in a specimen of *Gerrhosaurus flavigularis* examined, these fat-bodies extend forwards into two spaces ventral to the peritoneum, without any free bulge into the body-cavity.

A series of transverse sections taken through an *Amphisbæna darwinii* (*cf.* figs. 4–7), or a dissection of the animal, show that while anteriorly to the umbilical region the fat-bodies bulge into the body-cavity, in the more posterior region the peritoneum is simply displaced inwards. Thus we have here the two conditions above referred to displayed in different parts of the same animal; and this is true, in a less striking manner, of other Lizards (*cf.* figs. 11 & 12), in which the hinder portions of the fat-bodies are obviously quite outside the peritoneal cavity.

The typical condition of these fat-bodies seems to be that of distinct lobed or festooned masses, suspended in distinct cavities [1] lined with smooth membrane, which are no part of the ordinary peritoneal cavity.

It seems to me that to the extension of these cavities, which surround the fat-bodies, outside the peritoneum, so as to carry it away from the body-walls, we must attribute the peculiar state of things in Monitors, described by Beddard: (1) Proc. Zool. Soc. 1888, pp. 98–107; (2) Anatomischer Anzeiger, 1888, pp. 204–206.

In the Monitors these two cavities communicate anteriorly, so as to form a single horseshoe-shaped cavity, with its free ends

---

the alimentary canal into the substance of the fat-bodies, and regarding these and the liver simply as store-houses of combustible food-material, one is struck by the remarkable fore-and-aft symmetry displayed by the liver at one end of the trunk and the fat-bodies at the other, in their relations to the adjacent organs. And in this connection one is induced to comment upon the condition of the liver in *Siphonops annulatus* as described by Wiedersheim 'Die Anatomie der Gymnophionen,' p. 74, fig. 82):—"Die Leber stelt ein langes, bandartiges in zahlreiches Lappen zerfallendes Organ dar. Die einzelnen Lappen entstehen durch tiefe circulare Einschnitte, liegen schollenartig aufgereiht unt meistens in dichter gegenseitiger Berührung." The "Lappen" are in *Epicrium* "mehr gelblich gefärbt," while in *S. annulatus* they possess "eine mehr graugrüne Färbung."

Again, it may be worth while to note here the fate of the liver in *Petromyzon* (*cf.* Schneider, 'Beiträge z. verg. Anat. und Entwick. d. Wirbel.,' Berlin, 1879, pp. 93, 94); Rolleston ('Forms of Animal Life') says, "At the metamorphosis the tubular structure is lost; fat appears in the cells; the gall-bladder and bile-duct are absorbed."

It must be remembered, however, that (as described in this paper) the fat-bodies in some Reptiles project but slightly or not at all into the peritoneal cavity.

[1] It may be sometimes, however, hard to trace distinct spaces round these bodies.

pointing backwards, which in the hinder region extends up the sides as far as the kidneys.

I believe that the views to which I have been led largely agree with those of Mr. Beddard[1]. We agree that the condition in Monitors to which he has drawn attention is unlike that in other Lizards and well worthy of study. There are, however, certain of his conclusions and suggestions which, after a careful examination of Monitors[2] and other reptiles, I am unable to accept.

Beddard says (1, p. 100): "In Monitors . . . . . when the body-walls are cut open and reflected, the alimentary viscera are not exposed as they are in Iguana. A loose membrane covers the viscera; the membrane looks as if it were simply the lining peritoneum of the abdominal cavity which had got separated and detached from the abdominal parietes; this is, however, not the case; *an examination by the aid of the microscope showed clearly that a layer of peritoneum covers the abdominal musculature*, and is quite distinct from the horizontal membrane; in *Varanus griseus the peritoneal layer* was particularly distinct, for the reason that it contained numerous pigmented corpuscles. . . . *This horizontal membrane also separates the kidneys from the reproductive glands*; the latter lie internally to it; the kidneys are placed outside it."

The italics in the above quotation are mine, and serve to indicate the passages to which I would call attention.

It is certain that the space surrounding the fat-bodies and separated from the peritoneal cavity containing the intestines, by the "horizontal" membrane that wraps round these, is not due merely to some accidental or post-mortem separation of this membrane from the body-wall; and that the space in question, which I will term the *circumadiposal cavity* (*ca.c*, in figs. 14–17), is lined by a smooth membrane which covers the body-wall, and is reflected to form the exterior layer of the so-called "horizontal membrane."

I presume that, in saying that the microscope shows this lining membrane to be peritoneum, Beddard merely means that it forms a natural free surface, and is not a rough line of parting produced by a tear. More than this the microscope could not well prove; nor does the presence of pigment do so, since pigment, though common in the peritoneal lining of the body-cavity, is not confined to this layer. It may occur in the more external and muscular layers of the body-wall, as can be seen in transverse sections of Snakes.

Now, in no reptile examined have I observed any connection between the peritoneal cavity proper and the circumadiposal cavities; and since (as Beddard, judging by his paper (1, p. 100), would admit) the circumadiposal cavities of the Monitors are homologous with the inconspicuous spaces round the fat-bodies in other Lizards, which there is no good reason to regard as parts of the peritoneal cavity, I hold that until such a connection shall

[1] I would acknowledge the kind and practical interest that Mr. Beddard has taken in my work.

[2] I have examined two specimens of *Varanus indicus*, two of *V. nigro-punctatus*, and some ten small specimens of *V. niloticus*.

have been demonstrated, by a study of the development, everything points to the conclusion that the circumadiposal cavities are not homologous with any part of the peritoneal cavity proper of other types, but are altogether extra-peritoneal.

Again: I do not consider that the membrane "which surrounds the abdominal viscera has its exact counterpart in Crocodilia and Aves" (1, p. 106), except in so far as it is a part of the body-wall. I take it that the "omentum" of Birds is represented in Monitors by the ligament which passes between the stomach and the hinder part of the liver antero-dorsally, and the dorsal face of Beddard's horizontal membrane postero-ventrally. In Monitors, however, as in most other Lizards, it has not acquired that extension in a transverse direction which conduces to the formation of a *post-hepatic septum* in Birds, Crocodiles, and the Teiidæ (*cf.* my paper on the Subdivision of Body-cavity, above, p. 463).

As to the Crocodiles, Beddard says (1, p. 103) that the horizontal membrane "closely resembles a structure in the Crocodilia which has been described by Prof. Huxley as well as by others." Beddard describes this structure as follows (the italics are mine):—"This consists of a membrane, partly muscular, which is attached to the pubis and to the abdominal parietes behind, and in the median dorsal line to the backbone; it entirely envelops the coils of the intestines, so that they are not visible when the body-wall is cut through. Anteriorly this muscular expansion is attached to the fibrous compartments in which are lodged the two lobes of the liver; *the lungs are thus shut off from the abdominal cavity*; this membrane bears on the ventral surface the anterior abdominal veins: *there is evidently a close similarity, so far, between the Crocodile and the Lizard*; furthermore, in both animals the lateral regions of the membrane are connected with the lateral parietes by fibrous bands, and in both the fat-body lies outside of the membrane and outside of the abdominal cavity; the reproductive glands and the kidneys have a similar relation to the membrane in both types: in the Crocodile, as in the Lizard, *the reproductive glands and the kidneys are separated by the membrane*; the former lies within, the latter without, the abdominal cavity. The only differences are that in the Crocodile the membrane is largely covered by muscular tissue, and that instead of simply passing over the liver and stomach, it becomes connected with special sheaths enveloping these organs. In these points the Crocodile, as Prof. Huxley has pointed out, resembles birds. The above considerations point, in my opinion, to *an unmistakable resemblance between the Monitor Lizards and the higher Sauropsida.*"

I have not at present observed a well-marked circumadiposal space round the subperitoneal fat-bodies of Crocodiles. But if, as I take it, the membranes above referred to in Monitors and Crocodiles are but the inner layers of the body-wall, they are doubtless homologous to a certain extent. I would add, however, with reference to the statement that the membrane in Crocodiles is "largely covered with muscular tissue," that (in my opinion) the ventral fat-masses that

lie in distinct spaces beneath the skin, separated from the abdominal cavity by a stout muscular tract, are not the homologues of the *subperitoneal* fat-bodies of the Monitors, but of *subcutaneous* fat-deposits occurring in the Sauropsida in addition to the subperitoneal (*cf.* p. 609). The fat-bodies of the Crocodiles that correspond to those of Lizards are more lateral than is usual in the latter group.

Thus the membrane that is referred to by Beddard as being muscular in the Crocodile, according to the view here expressed represents, in the ventral region, a great part of the muscular body-wall.

In the quotations given above the position of the kidneys relatively to the so-called "horizontal membrane" has been referred to. A reference to figs. 14 and 15 shows that in *Monitor niloticus* the hinder portion of the kidney projects well into the peritoneal cavity which contains the intestines and reproductive glands, and that the part in front of this lies as it were *in* the membrane in question, or between its peritoneal and parietal layers; so that, though the anterior portions of the kidneys project outwards into the circumadiposal cavities, the membrane referred to does not exactly separate these from the reproductive glands.

But, even if the whole of the kidney were shut out of the general intestinal cavity, this would, I think, neither be a point of special similarity to the Crocodiles nor have much morphological significance. We find such a condition not only in the Crocodiles but in Chelonia (*Emys*, *Testudo*). In Snakes (*cf.* figs. 8, 9, 10), and in the Lizards themselves, the extent to which the kidneys project into the peritoneal cavity is variable, and the Amphisbænidæ are, so far as I know, unique in the freedom with which these organs hang into the peritoneal cavity.

In birds, again, the kidneys, as opposed to the reproductive glands, are extra-peritoneal in position (*cf.* figs. 46 and 47 of my paper "On the Subdivision of the Body-cavity," Plate XLIX. above, p. 452).

I think that the preceding points to the conclusion that the membrane which in Monitors is seen to cover the abdominal viscera when the body-wall is first cut into, must be regarded as the peritoneum, backed by the lining membrane of the space into which the fat-bodies project—that it, in fact, consists of the peritoneum together with another layer belonging to the body-wall.

With regard to the term "*horizontal*" membrane or septum it seems to me that it is used to comprise two things, which may with advantage be considered apart. There is, firstly, the membrane, referred to above, which divides the circumadiposal and peritoneal cavities. To this I would attach no particular morphological importance. It appears to me not to divide one part of the body-cavity proper from another, but to be, as Beddard (1, p. 100) seems fully to recognize, but a special development of a tract which occurs in other Lizards, correlated, as I would say, in Monitors with the greater extension of the circumadiposal spaces. In fact, in the separation of the membrane under discussion from the body-wall, the Monitors seem to be but following what is a line of weakness for Reptiles

generally. Thus, in the Snakes, Chelonia, Lizards, and Crocodiles, there is a more or less marked tendency to the separation of the inner peritoneal or visceral layer of the body-wall from the rest, the kidneys and fat-bodies being thus left more or less completely outside the peritoneal cavity.

On the other hand, Beddard's phrase (1, p. 105),—"the horizontal membrane in *Varanus*, which shuts off both lungs from the abdominal cavity,"—together with the reference which follows to the "membranous diaphragm" described by Martin (P. Z. S. 1831, p. 138), indicates that it is used to include tissue which shuts off the lungs from the peritoneal cavity. Here we have a fact of considerable interest; and neither the dissections nor the transverse microscopic sections that I have made have rendered it plain whether, as in birds, a pleural cavity originally exists, to be subsequently obliterated by adhesions, or whether, as I believe to be the case in *Testudo*, the lungs are not surrounded by any part of the body-cavity. Whichever be the case, the separation of the lungs by a "membranous diaphragm" from the peritoneal cavity which contains the liver and intestines is a feature that, so far as I know, is not found in any other Lizard. But, on the other hand, the lungs and liver are not thus separated in the Crocodiles either (*cf.* my paper "On the Subdivision of the Body-cavity &c.," § v. this vol.).

The preceding pages will show that in my opinion the Monitors bear no special resemblance to the Crocodiles, so far as the relations of the fat-bodies and the spaces and membranes about them are concerned. The shutting off of the lungs from the liver, while suggesting the condition in the birds, distinguishes them from the Crocodiles, and, in the absence of developmental data, it may be perhaps just as well explained by a reference to *Testudo*[1].

Again, seeing that some striking differences exist as to the subdivision of the body-cavity in the other Lizards (*cf.* the case of the Teiidæ above, Plate XLVIII. and text, p. 466), it appears to me doubtful whether, in our ignorance of the developmental history, the shutting off of the lungs from the peritoneal cavity in the Varanidæ has much or little significance for the systematist.

III. Subperitoneal Fat of Mammals.

To turn to animals outside the Sauropsida, we find among mammals deposits of fat on either side of the bladder (*e. g.* Kitten, Guinea-pig, Hedgehog, young Kangaroo). It is impossible in some cases to definitely mark off the fat in this position from that which passes forwards on the dorsal side to the kidneys; and both are supplied by branches from the femoral artery (Guinea-pig). If this vessel is the homologue of the femoral artery of Sauropsida, which supplies the fat-bodies (Lizards)—seeing that in Lizards, Crocodiles,

[1] *Emys*, in which the lungs only partly project into the body-cavity, would seem to stand as a link between *Testudo* and the majority of animals that have the lungs fully projecting into the cœlom, and to show that even such a striking feature as the exclusion of the lungs from the body-cavity may be of comparatively little systematic importance.

and Birds, owing to the backward extension of the kidneys, the fat-bodies in question do practically adjoin them—it becomes by no means improbable that the fat beneath the dorsal peritoneum posterior to the kidneys in mammals is the homologue of, or rather belongs to, the same series of deposits as the fat-bodies of the Sauropsida.

But the habit, so to speak, of these deposits in the two groups is considerably different. The Sauropsida with their backwardly situated kidneys, renal-portal system, and anterior abdominal veins, have these fat-masses either confined to the region just in front of the pelvic girdle, or extending right along on the ventral side as far as the stomach and liver; whilst in Mammals, where the vascular system is different, they are mainly dorsal in position.

IV. Some Remarks on the Function of the Subperitoneal Fat-bodies of the Sauropsida.

If, as above suggested, these fat-deposits in the Sauropsida correspond to those, so common in Mammalia, behind the kidneys, there would appear to be no more reason to seek a special function for them in one group than in the other, as some observers have done for the Reptiles.

These bodies, like the liver, can be regarded as stores of food-matter on the course of large blood-vessels, and of course they will be drawn upon whenever need arises—whether in the "winter sleep," as appears to have been usually assumed, or in the production of large masses of yolk for the eggs, or at any other time when food may be unattainable.

It should be noted that in both Amphisbænidæ and snakes (*A. darwinii* and *Tropidonotus natrix*), when still within the eggs (*cf.* figs. 4–7, 8, 9, 10), the fat-bodies are as well, or better, developed (proportionally) than at any subsequent period of life. This, together with the fact that there seems no marked difference in their size in the two sexes, would seem to show that their function is a general one and not specially related to reproduction, as has been suggested.

V. On Certain Subcutaneous Fat-deposits.

In Lizards we have fat ventral to the pelvic girdle (between it and the skin) and extending along the under part of the thigh and surrounding the "femoral glands" (when present). This seems to have no continuity with the *subperitoneal* fat-bodies above described. In the Crocodiles both the *subcutaneous* and the *subperitoneal* fat seem to be fairly well developed, the former being separated from the abdominal cavity by a muscular tract, which I think is that referred to by Beddard (1, p. 103, see above pp. 606 & 607) and compared to what he terms the "horizontal membrane" in Monitors. It appears to me, however, that only the lateral fat-masses of Crocodiles correspond to the ventral subperitoneal "fat-bodies" of the Lizards, and that the ventral deposits in Crocodiles belong to the subcutaneous series. Consequently the muscularity of the layer of tissue

between them and the abdominal cavity is accounted for by it being a part of the muscular abdominal wall, separated from the outer layer by the spaces surrounding the subcutaneous fat.

In birds, again, besides the subperitoneal fat of the "omentum," we have subcutaneous fat along the whole length of the trunk, on each side of the thorax and abdomen, and this extends on to the legs. This series of deposits is well seen in the unhatched chick. Doubtless subcutaneous fat is found in the above-named groups, in places besides those indicated, which, however, are those which I have specially studied in examining the interesting questions raised by Beddard's papers; but, as a general rule, not only in the above groups but also in mammals such subcutaneous fat is characteristic of the morphologically ventral face of the body rather than of the dorsal. Moreover the deposits in mammals seem largely to correspond with those in the Sauropsida. Nor is the degree of constancy of distribution of these subperitoneal and subcutaneous fat-deposits which exists surprising, if, as I think, this distribution is connected with that of the blood-vessels [1].

VI. On the Fatty "Spleen" of the Crocodiles.

I should like to draw attention to a curious body which seems very constant in all specimens of Crocodile. It is situated on the right side and is attached dorsally by a distinct peritoneal ligament, which extends obliquely from near the externo-posterior extremity of the right liver-lobe, to a spot more median than the anterior end of the reproductive gland (*cf.* above, Plate XLIX. fig. 43, with the "seeker" represented).

The only references to this body that I have seen occur in Hunter's 'Essays and Observations,' edited by Owen (vol. ii. p. 338), and in Owen's papers in this Journal for 1831, pp. 141 and 169. Hunter describes it as the spleen. Owing to the intestines being much folded, it is quite possible that this distinctly dextral body may be in the morphologically normal position of the spleen, *i. e.* suspended on the left side of the median membrane that supports the alimentary canal. But, on the other hand, as Hunter remarked (*loc. cit.* p. 339), there is "an oblong dark body placed in the root of the mesentery;" he says further on, "I imagine this is

[1] The ventral region of the body above referred to is, of course, the region where the mammary glands are apt to occur. These are generally allowed to be specialized cutaneous (sebaceous) glands, and they are described by Dr. Creighton (Journ. Anat. & Phys. vol. xi.) as arising in intimate association with deposits of fat. Now the *femoral glands* of Lizards open on the ventral side of the abdomen and thighs, and are frequently found surrounded by fat, and in microscopic sections strongly resemble sebaceous glands. Gegenbaur has recently shown that in the Monotremes the mammary glands do not conform to the type common to all the higher Mammalia, and yet we place the two types of gland in the same category; may it not somewhat similarly be suggested that in these quasi-sebaceous glands of lizards, and deposits of ventral subcutaneous fat, so commonly represented in Birds and Reptiles, we have the Sauropsidan modification of that which in Mammalia has developed into such typical structures as the mammary glands and the sebaceous glands in association with which the characteristic hair occurs?

analogous to the pancreas aselli, viz. a lymphatic gland; it is a good deal like the spleen of a bird."

In a paraffine section of a spirit-specimen this latter seemed more like a spleen than that first mentioned, which resembled rather a "fat-body" with an unusual supply of blood-vessels. I have no desire, however, to venture an opinion on histological grounds, especially as the preparations were not very good.

In young specimens, within the egg, this body is as distinct as in the adult [1], but it is quite yellow and soft, and fatty.

I have not seen any body corresponding to this in any other reptile, except in one out of two specimens of the lizard *Lialis*, in which there was a long yellow body with a very similar attachment (behind the end of the right liver-lobe), only more elongated than in the Crocodile. This, however, one would expect, considering the snake-like attenuation of the body in *Lialis*. This body occurred in a male. The other specimen that I saw was a female and contained no trace of such a body, thus differing from the Crocodiles, where both sexes possess the fatty "spleen."

In Parker's translation of Wiedersheim's 'Elements of Comparative Anatomy of Vertebrata' it is suggested that the "fat-bodies" of Reptiles should possibly be placed in the category of lymphoid tissues; and this suggestion may perhaps indicate a solution of the question as to this fatty "spleen" of Crocodiles,—may explain, I mean, the existence of a body at once resembling a normal lymphoid spleen and a lymphoid (?) "fat-body."

On the other hand, the situation of this structure is, but for the fact that it occurs only on the right side, largely suggestive of the corpus adiposum of the Amphibia.

VII. Conclusions.

(1) Deposits of fat, subperitoneal and subcutaneous, appear, among the Amniota, to have just such a constancy of distribution as one would expect of such deposits situated on the course of leading blood-vessels.

(2) The relations of the subperitoneal fat-bodies in the various groups of the Sauropsida correspond, and these bodies seem to admit of comparison with the subperitoneal fat of mammals.

(3) In the *Monitors* the space between the main, parietal, portion of the body-wall and the inner peritoneal layer that wraps round the abdominal viscera, appears to be merely an enlarged representative of the spaces round the fat-bodies in other lizards.

(4) The question of the relation of the Monitor's lungs to the body-cavity, from the abdominal portion of which they are, as previously described (Martin, Beddard), excluded by a "membranous diaphragm," needs further investigation. Such a condition seems not to be realized in any other reptiles except the Chelonia (*Testudo*).

(5) *So far as the subdivision of the body-cavity is concerned*, the

[1] As are the fat-bodies in certain snakes and lizards, so this would furnish no argument for regarding it as the spleen.

Monitors do not seem to show any special approximation to the *Crocodiles*; and in this respect the only important difference between the former and other lizards appears to be that the lungs do not lie in the same cavity with the liver. It is doubtful if this difference is of any importance to the systematist.

VIII. EXPLANATION OF PLATES LIX. & LX.

al. alimentary canal.
ao. dorsal aorta.
a.v. vitelline artery.
bl. urinary bladder.
c.a. corpus adiposum (fat-body).
ca.c. *circumadiposal cavity.*
cr.c. *circumrenal cavity.*
c.w. Wolfian body.
g. genital gland.
h. liver.
m. median septum (mesentery or ligaments supporting alimentary canal).
n. central nervous system.
o. ovum.
od. oviduct.
pp.c. pleuroperitoneal cavity (main body-cavity).
pul. lung.
pv. pelvic girdle.
re. kidney.
v.a. anterior abdominal or allantoic vein.
v.c.i. vena cava inferior.
v.d. vas deferens.
v.v. vitelline vein.
a. *pulmohepatic ligament.*
2'. *pulmohepatic recess* of left side.

Figs. 1–17. Transverse sections of Lizards and Snakes (chiefly the former), to show the relations of the fat-bodies and circumadiposal spaces to the pleuroperitoneal cavity and the general relations of the abdominal vicera.

Figs. 1–7. Transverse sections of advanced embryo of *Amphisbæna darwinii*, drawn from behind. The sections are in order from before backwards.

Fig. 8. Transverse section of common Adder, taken at such a place that it passes through both kidneys.

Fig. 9. Transverse section of advanced embyro of the common Grass-Snake, through one kidney and the embryonic genital gland.

Fig. 10. Transverse section of adult ♀ of common Grass-Snake, through one kidney; a large egg in the duct (distorted) fills most of the body-cavity.

Fig. 11. Transverse section of a specimen of *Lacerta*, in which the fat-bodies were specially well developed and extended forward further than usual.

Fig. 12. A more posterior section of the same animal, through the region of the kidneys, showing that in some regions the peritoneum hardly wraps round the kidneys or fat-bodies at all.

Fig. 13. A transverse section of another specimen of *Lacerta viridis*, showing a similar relation of the kidneys to the peritoneum in the region chosen.

Figs. 14–17. Transverse sections of a young *Monitor niloticus*. The sections in order from behind forwards.

We note here that the *circumadiposal* cavity extends forwards ventral to the

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7a

9a

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8

9

NEW SPECIES OF EROTYLIDÆ

E.Wilson del. Lith. & Imp. Camb. Sci. Inst.

liver, fig. 17 *ca.c*, and, from fig. 15, we see that the membrane which separates this space from the peritoneal cavity passes partly internally to the kidneys and partly outside them, so that it represents more than the peritoneum. Also, from fig. 14, that it is not correct to say that the membrane referred to excludes the kidneys from the peritoneal cavity, in which lie the genital glands, for the posterior portion of the kidney lies distinctly within this latter cavity.

4. Descriptions of new Species of the Coleopterous Family *Erotylidæ*. By Rev. H. S. Gorham, F.Z.S.

[Received November 11, 1889.]

(Plate LXI.)

The following descriptions are to some extent supplementary to my paper on the Erotylidæ read before the Society in 1883 (see P. Z. S. 1883, p. 75).

The types are either in my own collection or in that of Mr. E. Armitage, R.A.; a few of the specimens are also contained in the Cambridge collection formed by the late Mr. Crotch, whose MS. name I have retained for the first species here described; it was, however, placed in *Episcapha*, the specimen being hardly well enough preserved for critical examination.

1. Triplatoma varia, sp. nov. (Plate LXI. fig. 1.)

Elongata, subparallela, nigra, rufo-maculata, subnitida; vertice, prothoraceis utrinque macula arcuata; elytris fasciis tribus dentatis, prima per ramum cum basi conjuncta rufis; corpore subtus rufo piceoque variegato, femoribus infra rufo-maculatis.

Long. 17 *millim.*

Hab. Malacca, Penang (*coll. Crotch* and *E. Armitage*).

Head closely but distinctly punctured; antennæ with the third joint not much enlarged at the tip, the fourth to the eighth joints longer than broad. The thorax transverse, very finely and thickly punctured, smooth and shining, the front angles a little prominent, the sides almost straight, the front as wide as the base; hind angles rectangular. Elytra smooth, with fine serially punctured striæ and flat interstices, or very obsoletely subsulcate. The red markings are a broad spot on vertex of the head, a mark somewhat like a Hebrew letter *Caph* on each side of the thorax, the open side outwards, one corner reaching the front angle, the other prolonged towards the base.

On the elytra are three irregular fasciæ, much as in *T. gestroi*, Bedel, but less dentate; the first with a ramus to the base forms a sort of ring enclosing the shoulder, except on the costal side, the second arcuate, the third is near the apex; none of them approach nearer the suture than the first stria. The epipleuræ have a spot at the base, and one on each side of the metasternum and of each ventral segment are red.

T. varia is allied to, but amply distinct from, *T. gestroi*; it is smaller, smoother, the thorax is shorter, but it will fall into the

same section as proposed by Bedel, having the epipleuræ with a fine marginal stria. The absence of any central red mark on the thorax will serve to distinguish it from *T. cypræa*, Bedel, as well as the thorax not being at all opake.

I have only seen three examples of this species; it was labelled "*varia*" by Mr. Crotch, but was not described. It is in Mr. Armitage's collection. None of the specimens have any pilose dots on the abdomen, and are perhaps all females.

2. Episcapha annulata. (Plate LXI. fig. 2.)

Engis annulata, Macleay, Annulosa Javanica, p. 42; ed. Lequien, p. 150; Lacord. Mon. Erotyl. p. 61; *nec* Crotch, Cist. Ent. 1876, p. 407.

By assuming that the original describer passed over in silence certain characters, Lacordaire suggests, and Mr. Crotch had "no doubt," he referred to the species described by Lacordaire as *Episcapha oculata*. I think, on the contrary, the insect shown in our Plate fully coincides with Macleay's description. It is, however, rare in collections, the specimen figured being the only example I have seen; it was given me by Mr. W. L. Distant, and is probably from Java.

3. Triplax vittipennis, sp. nov. (Plate LXI. fig 3.)

Oblongo-ovata, ferruginea, crebre subtiliter punctata; elytris profundius punctato-striatis, interstitiis crebre punctulatis, nigris, vitta lata mediana rufa; antennarum clava fusca.

Long. 5 *millim.*

Hab. Africa, Zanzibar, Mhonda, Ouzigoua [*Hacquard*].

Var. *a. Capite superne nigro-piceo, elytrorum vittis ad apicem usque productis.*

Hab. Liberia, Junk River (*Stampfli*) (Mus. Leyden).

In this species the tibiæ are rather strongly widened, but not much so as to make me think it need at present be removed from *Triplax*. The head and thorax are pale blood-red, thickly and evenly punctured, the sides of the latter narrow a little to the front, and are a little rounded and very finely margined; both the front and hind angles are distinct, but not at all prominent, the front margin is nearly straight, the base is very evenly and gently bisinuate. The elytra are very evenly narrowed from the base towards the apex, each with eight distinct striæ with numerous punctures; the striæ unite in pairs near the apex, thus the fifth and sixth unite, and the sutural with the marginal one. The interstices are flat, except near the humeral callus, and are thickly punctate. The suture is black as far as the third stria and the margins including the epipleura externally to the seventh stria. The underside is strongly punctured. I have only seen the two specimens, one from each locality; the one from Zanzibar was given me by Dr. Sharp, and, considering the vast distance between the localities, that from Liberia does not differ more than could be expected in a widely distributed species.

4. Amblyscelis[1] ferrugineus, sp. nov.

Elongatus, postice subangustatus, totus ferrugineus, subnitidus, supra crebre subtiliter, infra crebre fortius punctatus; elytris striatis, striis subtilissime crenulatis, interstitiis minute punctatis.

Long. 7½–8 *millim.*

Hab. S. Africa (Natal) (*coll. Gorham*, Mus. Leyden) (*Finsch*).

Head with the front thickly, the crown more sparsely but more deeply punctured, the front edge of the epistome angularly but not deeply emarginate. The antennæ not reaching the base of the thorax, their club fuscous. Thorax transverse, the disc rather convex and the front angles depressed, finely but thickly punctured. Elytra with the humeral callus more distinct than in *A. natalensis*, Crotch, widest at the base, the interstices flat, except near the callus, where the striæ are deeper. The legs are as in *A. natalensis*, the thighs rather stout and compressed, the tibiæ very strongly triangularly widened near the apex, and setose externally at this part. Episterna and sides of the metasternum rather strongly punctate. No abdominal lines.

I received about a dozen specimens of this insect from the Rev. Canon Fowler, who obtained them from Boucard's collections; also one specimen communicated from Mr. Ritsema.

5. Brachysphenus egensis, sp. nov. (Plate LXI. fig. 8.)

Oblongo-ovatus, parum convexus, pallide castaneus, nitidus; elytris nigris, tenuiter flavo-marginatis, sutura et limbo laterali angustius fuscis, distincte punctato-striatis; antennis fuscis, articulis tribus basi pedibusque rufis.

Long. 8 *millim.*

Hab. Amazons, Ega (*Bates*); Guiana, Cayenne (*Reiche*; *coll. Crotch*).

Head and thorax very even and nearly smooth, yet not glabrous, owing to being very finely alutaceous and with indistinct stellate punctuation; the latter is at the base twice as wide as long, narrower in front; the sides rounded, the excavation in front rather deep and its base straight; prosternum much compressed, so as to be distinctly carinate in front, yet not projecting. Elytra widest a very little below the base, narrowed to the apex, the black discoidal plagia extending very evenly from the second to the seventh stria; beyond which, on the yellow margin, there is only the least trace of an eighth stria, near the apex usually about eight punctures. Metasternal and abdominal lines are distinct, the former long and reflexed but fine.

Two specimens in Mr Armitage's collection, and two in the Cambridge collection. May be placed next *B. cordiger*.

6. Brachysphenus ucayalensis, sp. nov. (Plate LXI. fig. 6.)

Oblongo-ovatus, rubidus, verticis puncto thoracisque punctis decem nigris; elytris nigris, juxta scutellum macula angusta

[1] *Amblyscelis*, Gorham, Notes from the Leyden Museum, vol. x. 1888, p. 144.

fasciisque duabus denticulatis, una mediana ad suturam interrupta, una subapicali arcuata luteis; antennis articulis duobus primis exceptis, tibiis tarsisque nigro-fuscis.

Long. 12 *millim.*

Hab. Peru, R. Ucayali (*Bartlett*).

Var. *prothorace nigro-marginato, punctis duobus externis cum margine conjunctis, elytris macula parva humerali et epipleuris basi fulvis.*

Hab. Amazons (*Bates*).

Head and thorax forming a nearly even semicircle in front, the latter being excised deeply, but not widely, for the reception of the former, both of a uniform rich orange-red; in the typical examples from Ucayale only the extreme limb, and this so narrowly as not to be apparent, is blackish. The ten spots are placed, four transversely in front, and six in a row behind these, the three on each side being arcuate, the four central ones forming a square. The scutellum is either rufous or pitchy. The elytra are evenly punctate-striate, the rows of punctures very finely impressed, the interstices smooth and shining. The underside wholly of the rich red colour of the head and thorax. The metasternal and abdominal lines both very fine and short. The prosternum is compressed, forming a blunt keel, a very little prominent in front. The elytral fasciæ are yellow, the basal markings more orange-coloured. The first fascia commences rather before the middle of the margin, but is oblique, reaching the suture about the middle; it has two or three irregular teeth on each side. The epipleuræ are quite black in the typical examples. The legs are of the body-colour, with black tibiæ and tarsi; in the variety the tibiæ are rufous at their tips.

In the Amazons specimens the limb of the thorax is more distinctly black, and on the middle of the front has a triangular black spot, and on the base three such spots attached to it, the two exterior discoidal spots also being united, so that the six remaining spots form two equilateral triangles; the wide concave part of the epipleura is yellow. Four specimens of the typical form from Mr. E. Bartlett, and two of the variety from Crotch's collection, and two others from the Amazons in the collection of E. Armitage, Esq.

7. BRACHYSPHENUS BISTRIFOLIATUS, sp. nov. (Plate LXI. fig. 5.)

Late ovatus, ater, nitidus; elytris perobsolete punctato-striatis, singulis macula magna trifoliata basali, fasciaque lata, ad suturam interrupta, pone medium aurantiacis.

Long. 13 *millim.*

Hab. Peru, Chancamayo (*Buckley*).

Labrum and palpi yellow; head and thorax smooth, the latter glabrous, twice as wide as long at the base, the front narrower, the basal median lobe nearly covers the scutellum; prosternum compressed, the apex of the process wrinkled. Elytra with red epipleuræ, but the limb very narrowly black. The markings are peculiar; the basal one is like three irregularly shaped red spots

united, the exterior one being in one instance disunited. The merest rudiments of punctures or striæ remain. The scutellum is depressed at the base to receive the lobe of the thorax. It is difficult to compare this with any other species. It is, I think, best placed next *B. distinctus*.

8. Brachysphenus batesi, sp. nov. (Plate LXI. fig. 7.)

Breviter oblongus, fere ellipticus, aterrimus, glaber; elytris dimidio basali flavis, fasciis tribus e maculis irregularibus nigris formatis, prima basali valde undulata, secunda maculas quatuor punctiformes præbente, tertia e strigis sex obliquis plerumque constituta in singulis elytris.

Long. 10–11 *millim.*

Hab. Amazons (*Bates*).

The form of this species is unusally convex; it is oblong, almost evenly wide before and behind, the extremity of the elytra being a little more pointed than the front. The surface is quite smooth in two specimens, in two others there is on the elytra very obsolete serial punctuation. The wavy fasciæ on the yellow part of the elytra are variable, being very often formed, in the basal one, of two inverted V's, thus ΛΛ, with a dot external and a linear mark internal to them. In the third fascia there are three V's inverted, but the linear spots are often all disunited; the margin of the black apical half is tridentate on each elytron. This is one of many beautiful species of Erotylidæ brought by Mr. H. W. Bates from the Amazons which have hitherto escaped recognition. Two specimens in Crotch's collection and two in that of E. Armitage, Esq. It should be placed after *B. musicalis*.

9. Brachysphenus incas, sp. nov. (Plate LXI. fig. 4.)

Breviter ovatus, niger; elytris tenuiter geminato-striato-punctatis, fasciis duabus ad suturam interruptis, una basali, una pone medium, epipleurisque flavis.

Long. 11 *millim.*

Hab. Peru, Chancamayo.

This insect resembles rather closely *B. bizonatus*, Crotch, and is allied to it by the geminate series of punctures and by the yellow epipleuræ; it differs from it in being less convex, and by the form of the yellow fasciæ, which are not so broad; the anterior one is basal and is notched on its apical side, so as to appear somewhat arcuate; the postmedial fascia is irregular on both its sides (but not dentate), rather narrower near the suture. The epipleuræ are yellow except in the apical quarter, and, as usual, the entire extremely narrow limb of the margin is black.

This species also somewhat resembles *B. epipleuralis*, Crotch; the geminate series of punctures will separate it. No metasternal nor abdominal lines are present. Three specimens, in my own collection.

10. BRACHYSPHENUS MUTABILIS, sp. nov.

Oblongus, elytris gibbosis, læte rufus; antennis, corpore infra, pedibus elytrorumque maculis duabus subquadratis nigris, elytris distincte punctato-striatis.

Long. 12 *millim.*

Hab. Peru, Chancamayo (*Buckley*).

Like *B. glyptoderus*, but differently shaped; the thorax is wider and has the sides much more rounded; the elytra are much more convex, their surface (as well as that of the thorax) is smoother, but with the series of punctures more distinctly impressed; the scutellum is black in one example, reddish in another; the underside is black, excepting the head, which is wholly red, the sides of the thorax, the two apical segments, and a spot in the middle of two segments preceding them. The coxæ and the trochanters are pitchy red. The thorax in one example has a spot on the front margin, four small ones transversely placed, and three linear basal marks, but all nearly obliterated. This insect is no doubt subject to variation, but, from its form and the smooth surface, is distinct from *B. glyptoderus*.

11. BRACHYSPHENUS PERVERSUS, sp. nov.

Ater, glabratus; elytris singulis seriebus quinque punctorum postice abbreviatis, externe punctis nonnullis confuse dispersis; flavis, sutura, limbo laterali tenuiter plagiaque magna in singulis suturæ adjuncta nigris, abdomine castaneo-rufo.

Long. 12 *millim.*

Hab. Colombia, Medellin.

This species resembles no other that I am acquainted with except *Acronotus annularis*. If the yellow ring of that species were obliterated just behind the scutellum the pattern of the elytra would be nearly similar. The head and thorax are, however, entirely jet-black. The structure of the prosternum is, moreover, that of *Sternolobus*. The sterna, legs, epipleuræ, and limb of the elytra are black; the abdomen chestnut-red, without spots or clouds. The form of the insect is almost exactly that of *Acronotus*; the elytra, however, are rather more convex than in *A. annularis*.

12. AULACOCHILUS MOLUCCANUS, sp. nov.

Late ovatus, nigro-subcærulescens, glaber, nitidissimus, pedibus abdomineque castaneis, elytris convexis.

Long. 7 *millim.*

Hab. New Guinea.

Var. *immaturus? piceus, corpore infra dilutiore.*

Hab. Mysol (*coll. Armitage*).

Head smooth, excepting the epistome, which is rather thickly punctured; antennæ pitchy black, the apex of the club and the basal joint paler, the third joint distinctly elongate, the fourth to the seventh bead-shaped, the eighth transverse; palpi pitchy red. The thorax is, at the base, more than twice as wide as long, the base

bisinuate, the sides narrowed to the front, neatly and distinctly thickened and a little rounded-in to the front angles, which are acute; the front margin scarcely emarginate, nearly straight. The elytra are strongly convex, evenly ovate, very narrowly margined, with a slight fossa near the middle of their margin, in which are two or three obsolete traces of punctures, indicating the marginal stria. Underside smooth, the legs, including the coxæ, chestnut-red; the prosternum very wide, in front forming a small, not prominent point, from which to the base it forms an equilateral triangle between the coxæ; mesosternum short and transverse, but quite distinct; all these with the rest of the body, except the abdomen and the epipleuræ, are nearly black in the New-Guinea specimen, but in the one from Mysol they are only a little darker than the legs and abdomen; this is, however, obviously due to the less matured condition of this specimen. This is an aberrant species, if it is really an *Aulacochilus*; it is, however, best so placed till the acquisition of more specimens enables dissections to be made. For the specimen from New Guinea I am indebted to Dr. Sharp.

13. ÆGITHUS ARMITAGEI, sp. nov.

Oblongo-ovatus, valde convexus, niger, brunneo-picescens, nitidus; elytris flavis, sutura tenuiter et tertia parte apicali nigris, gemellato-striatis.

Long. 7–10 *millim.*

Hab. Amazons, Ega.

This is a very distinct species of *Ægithus*, its nearest ally perhaps being *A. dichrous*, Crotch; it is, however, less hemispherical and less convex than that species; it is also somewhat allied to *A. discoideus*, Gorham, a species found in Costa Rica.

Head and thorax pitchy black with black margins; antennæ rufous as far as the fifth joint. Scutellum pitchy black. Elytra quite smooth, excepting a sutural and three pairs of discoidal striæ, formed of minute points very faintly impressed. The sutural stria vanishes before the middle, and the discoidal striæ on entering the black apical third. Epipleura coloured with the upper surface, limb narrowly black. Underside and legs pitchy.

Two specimens in the collection of E. Armitage, Esq., R.A.

14. ÆGITHUS BARTLETTI, sp. nov. (Plate LXI. figs. 9, 9 *a*.)

Fere hemisphæricus, niger, nitidus, sublævis; elytris punctis dispersis, et in seriebus subgeminatis sat distinctis impressis, maculis tribus magnis luteis, duabus basalibus, una transversa subapicali.

Long. 10 *millim.*

Hab. East Peru (*Bartlett*).

Very convex, but rather more oblong than hemispherical, shining black and smooth, excepting the elytra, which have each three double series of small but distinct punctures, which are, however, irregular and becoming confused here and there with other dispersed punctures of the same size. The basal luteous spots are of an irregular oblong shape, the external one is continued on the epipleura. The

form of *Æ. bartletti* is that of *Æ. dichrous*, Crotch, but it is rather more oblong.

I have only seen the specimen given me some years ago by Mr. Edward Bartlett, of Maidstone, by whom it was captured, with many fine and new Erotylidæ, in Peru.

EXPLANATION OF PLATE LXI.

Fig. 1. *Triplatoma varia*, sp. n., p. 613.
2. *Episcapha annulata*, p. 614.
3. *Triplax vittipennis*, sp. n., p. 614.
4. *Brachysphenus incas*, sp. n., p. 617.
5. —— *bistrifoliatus*, sp. n., p. 616.
6. —— *ucayalensis*, sp. n., p. 615.
7. —— *batesi*, sp. n., p. 617. 7 *a*. Side view.
8. —— *egensis*, sp. n., p. 615.
9. *Ægithus bartletti*, sp. n., p. 619. 9 *a*. Side view.

5. Description d'une nouvelle *Locustella* de la Corée. Par L. Taczanowski, C.M.Z.S.

[Received November 9, 1889.]

Locustella pleskei, sp. nov.

Locustella fasciolata, Tacz. P. Z. S. 1888, p. 455.

L. ochotensi *simillima, sed statura majore, rostro multo longiore, colore partium superiorum corporis grisescentiore, plumis dorsalibus unicoloribus et cauda longiore distinguenda.*

♂ ad. Parties supérieures du corps d'un gris terreux assez foncé, parfaitement unicolore, sans aucune trace de nuance plus foncée au disque des plumes dorsales et du sommet de la tête, et ce n'est qu'au croupion que la couleur est légèrement olivâtre ; plumes alaires concolores au dos sont bordées d'un liseré un peu plus clair que le fond de ces plumes, fin et distinct sous certain jour ; une raie sourcilière d'un gris blanchâtre s'étend depuis les narines jusque sur les côtés du cervix, plus blanchâtre au dessus des yeux, plus grisâtre dans la partie postoculaire et au dessus des lores ; ces derniers traversés par une raie médiane foncée, prolongée en arrière de l'œil sur le dessus des tectrices auriculaires, région auriculaire plus pâle parsemée sur toute la surface de nombreuses stries blanchâtres tout petites : la paupière inférieure garnie d'une bordure blanchâtre très fine. Tout le dessous du corps est blanc, pur sur le milieu du ventre et de la gorge, tandis que sur la région jugulaire et sur la poitrine il est teint d'une nuance grisâtre très légère ; côtés de l'abdomen sont d'un gris semblable à celui du croupion mais plus pâle ; souscaudales grises entourées d'une large bordure ocreux blanchâtre. Queue grise tirant légèrement au cendré dans certaines directions de la lumière, toutes les rectrices, sauf les deux médianes, terminés par une bordure blanchâtre, plus blanche sur la page inférieure, et toutes traversées par une douzaine

de raies obscures, dont les trois préapicales sont le plus foncées et assombrissent cette partie de leur barbe interne, sur les rectrices médianes les raies sont moins visibles que sur les autres. Bec brun foncé à mandibule inférieure plus pâle et un peu jaunâtre à la base, la mandibule supérieure n'a qu'une trés fine bordure jaunâtre à la base ne dépassant pas les narines; pieds d'un brun clair, plus foncés sur les doigts; ongles bruns; iris brun foncé.

Les trois mâles adultes, tués 15 juillet 1887, sont en plumage fort usé mais complet et n'ont pas encore commencé la mue, la coloration n'est pas done facile à aprécier; il paraît cependant que dans la robe fraîche la couleur des parties supérieures du corps doit avoir une teinte olivâtre comme celle du *Calamoherpe palustris*, mais probablement plus foncée, et non pas roussâtre propre à la *C. ochotensis* en plumage frais.

Cet oiseau est très voisin sous tous les rapports à la *Calamodyta ochotensis* (Midd.) de Kamtschatka, mais il est d'une taille distinctement plus forte, à bec beaucoup plus long, la queue plus longue, les plumules dorsales et celles du sommet de la tête unicolores sans aucune trace du disque plus obscur, la barbe externe de la 2e remige plus foncée, le bec en général plus foncé. La formule alaire tout-à-fait la même, mais la remige abortive est distinctement plus longue et plus large; la 3e remige est également la plus longue, mais la différence entre les 2e et 4e ne peut pas être estimée à cause de leur état usé. Les rectrices sont également larges et également graduées; la différence entre les rectrices médianes et les externes est plus grande de 2 millimètres.

Dimensions :—Longueur totale 180, vol 223, aile 70, queue 65, bec de la commissure 21, bec du bord antérieur des narines 11, tarse 23, doigt médian 16, ongle 4, 5, distance entre le bord des ailes et de la queue 52, entre les rectrices externes et les médianes 20 millimètres.

Longueur totale 179, vol 241, aile 73, bec de la commissure 22, bec du bord antérieur des narines 11, tarse 27 millimètres.

Comme le plumage de nos exemplaires est fort usé les dimensions des ailes et de la queue doivent être plus fortes dans la robe fraîche.

M. Kalinowski a trouvé une colonie de ces oiseaux établie pour la nidification dans des petits ilôts éloignés d'un kilomètre de la côte tout près de Tchimulpo; ces ilôts sont couverts de buissons et d'une dense végétation herbacée; et qui pendant le reflux sont réunis à la côte. Le voyageur a entendu aussi le chant de cet oiseau au bord de le rivière Séoul, mais n'a pas pu le retrouver.

Je dédie cet oiseau à mon ami M. Theodore Pleske, savant Ornithologiste du Musée de St. Pétersbourg.

6. On a new Mungoose allied to *Herpestes albicaudatus*.

By Oldfield Thomas, Natural History Museum.

[Received November 20, 1889.]

(Plate LXII.)

In a Monograph of the African Mungooses which I had the honour of laying before this Society in 1882[1], the extreme constancy in the size of the teeth in this group was pointed out, and the species were shown to be readily distinguishable by the relative dimensions of their posterior cheek-teeth, both upper and lower. While the more typical and specialized species, such for example as *H. ichneumon*, have their $\frac{m^2}{m_2}$ very small, and averaging in its greatest diameter less than 60 per cent. of the last premolar ($\frac{p^4}{p_4}$), one species, *H. albicaudatus*, forming the type of the subgenus *Ichneumia*, has this percentage 70 or more, and all the teeth are of a much less specialized and secant type than in the others.

The species I now propose to describe is remarkable for having its posterior teeth even larger than in *H. albicaudatus*. The type specimen is a skeleton without a skin, which has been some time in the Cambridge Museum, and which the authorities of that institution have been good enough to transfer by way of exchange to the National Collection. This specimen is believed to have been collected by Mr. T. E. Buckley either on the Limpopo or in Zululand, but most unfortunately all definite record of its history has been lost.

The most striking characteristic of the new species, which may be termed *Herpestes grandis*, is its large size and great length of limb. Its skull is only exceeded in length, and that very slightly, by one skull in the whole Museum collection of Mungooses, namely by that of the type specimen of *H. galera robustus*, Gray[2], a thickly built, short-limbed form, whose long-bones are nearly 20 per cent. shorter than are those of *H. grandis*.

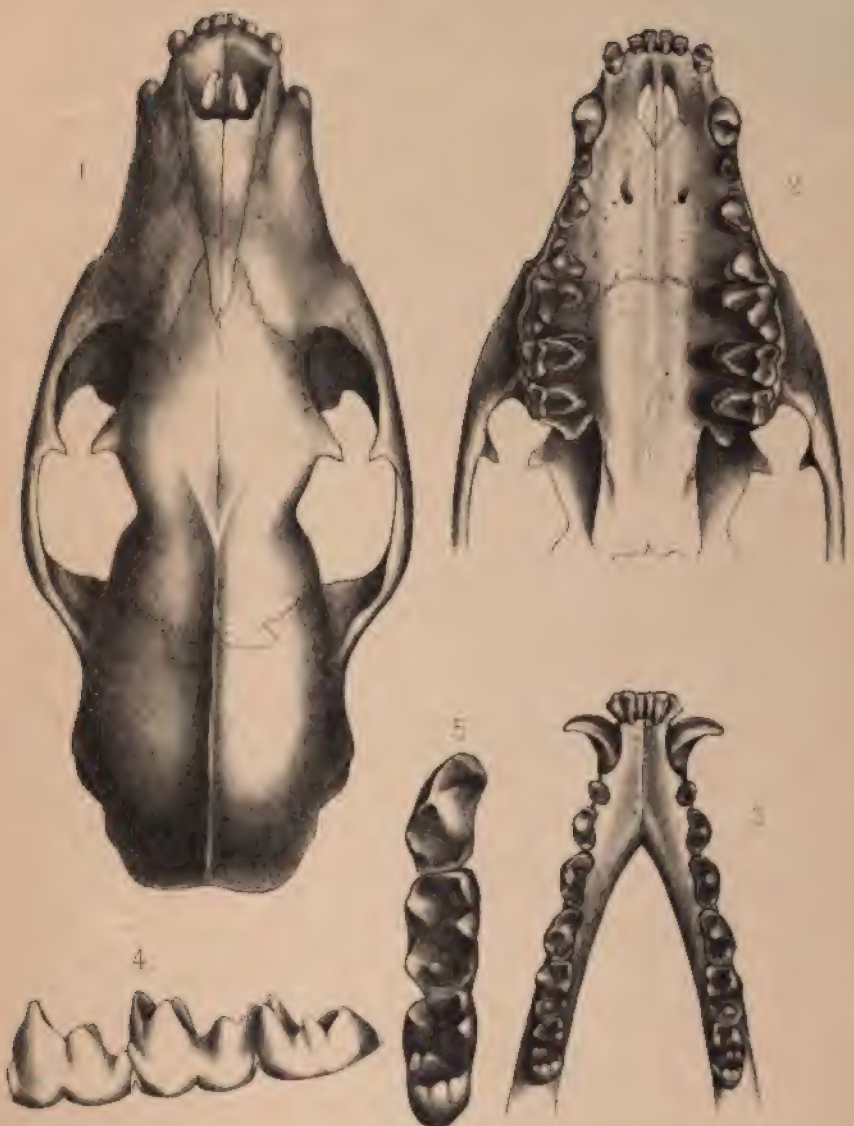
Comparing now *H. grandis* with *H. albicaudatus*, to which alone it is in any way closely related, we find that that species occasionally attains dimensions approximately equal to its own, although the great majority of specimens, especially those from North-east Africa and Arabia[3], are very much smaller.

The real difference between the two lies in the form and dimensions of the teeth. Firstly, in *H. grandis* the canines both above and below are markedly longer and heavier than in *H. albicaudatus*, exceeding those in the largest available specimen of that species by at least 2 mm. in length above and 3 mm. below, and in thickness by 1 or 1½ mm., although it is almost impossible to take the measurements exactly, owing to the absence of a distinct cingulum in this

[1] P. Z. S. 1882, p. 59 *et seqq.*

[2] See the above-quoted paper, p. 72.

[3] Since my Monograph was written, Mr. A. S. G. Jayakar has obtained examples of this species at Muscat.



HERPESTES GRANDIS.

group. The premolars are all rather longer both vertically and horizontally, and the cusps higher and more distinct. $\underline{P^4}$, $\underline{m^1}$, and $\underline{m^2}$ are on the whole similar to those of the allied species in their form and relative proportions, but are all markedly larger (compare the dimensions given below with those on p. 78 of my former paper).

But it is by the characters of the lower molars that the new species may be most readily recognized. As to size simply, the length of the two molars combined is in *H. grandis* 17 mm., while in the largest of a considerable series of *H. albicaudatus* this combined length only attains to 14·4 mm., its ordinary amount being about 13 mm. In structure, as will be seen by Plate LXII. figs. 4 and 5, these teeth in *H. grandis* are more complicated than in the older known form; in $\overline{m^1}$ there is not so much difference, except that the cusps and hollows are more marked, and the ridge running round the posterior half of the tooth, or "talon," is much sharper and better defined. In $\overline{m^2}$, firstly, the two antero-internal cusps, the paracone and metacone of Mr. Osborn's nomenclature of tooth-cusps[1], which have coalesced in *H. albicaudatus*, are sharply and distinctly separated from one another, so that the primitive anterior triangle forming the blade of the tooth is as well defined as in $\overline{m^1}$; secondly, in the talon, the extra median external cusp characteristic of *H. albicaudatus* (see p. 76, fig. 1 of the monograph) is duplicated in *H. grandis*, being supplemented by a second cusp on its internal slope; then the posterior edge of the talon is more developed, crenulated, and with its centre sharply and prominently notched in the middle line. As a result of this increase in complexity, the size of $\overline{m^2}$ as compared to $\overline{m^1}$ is much increased; for while in *H. albicaudatus* its length is never more than from 80 to 83 per cent. of that of the latter tooth, in *H. grandis* the two teeth are of practically the same length, $\overline{m^2}$ being no less than 96 per cent. as long as $\overline{m^1}$.

In view now of the extreme constancy of the teeth in the present group, both in size and structure, I feel that it would be impossible to refer the Cambridge skeleton to *H. albicaudatus*, and can only describe it as new, trusting at the same time that its external characters will not long remain unknown.

As will be seen from the figure (Plate LXII. fig. 1), the skull of *H. grandis* is characterized by its slenderness and by the great length of its facial as compared to its cranial portion.

In the skeleton both *H. albicaudatus* and *H. grandis* are remarkable for not possessing an entepicondyloid foramen to the humerus, the bony bar usually closing in this foramen being unossified. All other true Mungooses have this foramen closed in by bone, with the exception of the aberrant genera *Galidia*, *Galidictis*, and sometimes *Suricata*. This fact, combined with the addition of a second allied species, gives increased validity to the group "*Ichneumia*," recognized as a subgenus in my monograph, but which may possibly in the future have to be admitted as a distinct genus.

Dimensions of the type specimen:—

Skull. Length (from back of condyle to gnathion) 112 mm.; basal

[1] Amer. Nat. 1888, p. 1072.

length 105; greatest breadth 52; nasals, length in middle line 28, greatest breadth 11; interorbital breadth 22·5, intertemporal breadth 21·5; palate, length 67, to cross line 41; basi-cranial axis 33·5; basi-facial axis 72·5; facial index 217.

Teeth. P^2, horizontal length 6·1; p^3, length 6·3; p^4, external length 7·4, anterior breadth 7·7, greatest diameter 10·3; m^1, length 6·0, breadth 9·5; m^2, length 4·8, breadth 8·2; $\overline{p^3}$, length 7·0; $\overline{p^4}$, 8·3; $\overline{m^1}$, 8·4; $\overline{m^2}$, 8·1.

Skeleton. Scapula, length 69, breadth 34; length of humerus 99, radius 93, ulna 111, pelvic bone 88, femur 110, tibia 125, fibula 116, calcaneum 35, longest metatarsal bone 59·5.

EXPLANATION OF PLATE LXII.

Fig. 1. *Herpestes grandis.* Upper view of skull.
2, 3. Upper and lower jaws of ditto, buccal aspect.
4, 5. Last three lower teeth of ditto ($\overline{p^4}$, $\overline{m^1}$, and m^2), external and buccal aspects.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1889.

Jan. 1. 2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.

2. 1 Great Wallaroo (*Macropus robustus*), ♀. Born in the Menagerie.
   1 Coot (*Fulica atra*). Presented by Mr. J. Cutting.
   1 African Zebu (*Bos indicus*), ♀. Presented by W. Mackinnon, Esq., F.Z.S.

4. 2 Red-and-Yellow Macaws (*Ara chloroptera*). Presented by Lady Meux.
   1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by Lady Meux.
   1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Lady Meux.
   1 Verreaux's Guinea-fowl (*Numida edouardi*). Presented by Percy C. Reid, Esq. From the Zambesi, East Africa.

6. 1 Greek Partridge (*Caccaba saxatilis*). Presented by H. Hanauer, Esq., F.Z.S. From Bussorah.

7. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Deposited.

8. 1 Grey Ichneumon (*Herpestes griseus*), ♂. Presented by C. L. Curtis, Esq.
   1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by F. Buckland, Esq.

9. 1 Common Paradoxure (*Paradoxurus typus*), ♀. Presented by the Rev. J. de Gruchy.

10. 5 Clotbey's Larks (*Rhamphocorys clotbeyi*). Purchased. See P. Z. S. 1889, p. 26.
    5 Algerian Shore-Larks (*Otocorys bilopha*). Purchased. See P. Z. S. 1889, p. 26.
    2 Rosy Bullfinches (*Erythrospiza githaginea*). Purchased. See P. Z. S. 1889, p. 26.

11. 1 Masked Parrakeet (*Pyrrhulopsis personata*). Deposited.
    1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Presented by C. Elliott, Esq.

12. 1 Tawny Owl (*Syrnium aluco*). Presented by Mr. T. E. Gunn.
    2 Red-backed Pelicans (*Pelecanus rufescens*). Purchased.

15. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Deposited.

Jan. 16. 1 Brown Capuchin (*Cebus fatuellus*). Presented by F. H. V. Henry, Esq.
18. 2 Red-billed White Ibises (*Eudocimus longirostris*). Purchased. See P. Z. S. 1889, p. 26.
19. 1 Rufous-necked Wallaby (*Halmaturus ruficollis*), ♂. Received in Exchange.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Henderson.
22. 1 Chough (*Pyrrhocorax graculus*). Presented by A. Mudge, Esq.
1 Sharp-nosed Crocodile (*Crocodilus acutus*). Received in Exchange.
24. 1 Common Fox (*Canis vulpes*), ♀. Presented by H. F. Sparrow, Esq., Lieut. "The Buffs."
1 Gold Pheasant (*Thaumalea picta*), ♂. Presented by Mrs. Theodore Lloyd.
1 Silver Pheasant (*Euplocamus nycthemerus*), ♂. Presented by Mrs. Theodore Lloyd.
25. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by Mr. Lishman.
1 Serval (*Felis serval*). Presented by H. C. V. Hunter, Esq., F.Z.S. From Malindi, E. Africa.
1 Common Fox (*Canis vulpes*), ♂. Presented by E. Baldwin Cashel, Esq.
28. 2 Himalayan Monauls (*Lophophorus impeyanus*), ♂. Deposited.
29. 1 Alligator (*Alligator mississipiensis*). Presented by Mrs. G. Peacock.
30. 1 Aard Wolf (*Proteles cristatus*), jr. Purchased.

Feb. 3. 1 Golden Eagle (*Aquila chrysaëtus*). Presented by Thomas Barclay, Esq. From Inverness-shire, N.B.
5. 1 Areolated Tortoise (*Homopus areolatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
7 Tuberculated Tortoises (*Homopus femoralis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1889, p. 85.
2 Well-marked Tortoises (*Homopus signatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1889, p. 85. From the Clanwilliam Mountains, Cape Colony.
1 Robben-Island Snake (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Infernal Snakes (*Boodon infernalis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Smooth-bellied Snakes (*Homalosoma lutrix*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. From the Karoo, Groot Fontein, Cape Colony.
1 Many-spotted Snake (*Coronella multimaculata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. From the Karoo, Groot Fontein, Cape Colony.
1 Hissing Sand-Snake (*Psammophis sibilans*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
7. 1 Tropical Squirrel (*Sciurus æstuans*). Presented by Pedro Suarez, Esq.
1 Adorned Ceratophrys (*Ceratophrys ornata*). Presented by Capt. Hairby.
8. 4 Marbled Polecats (*Putorius sarmaticus*). Presented by Col. Sir Oliver B. C. St. John, K.C.S.I., R.E. See P. Z. S. 1889, p. 85. From Quettah.

Feb. 9. 8 Indian Gerbilles (*Gerbillus indicus*), 2 ♂, 6 ♀. Presented by Dr. J. Gilbert.
1 Jackdaw (*Corvus monedula*). Presented by Basil Carter, Esq.
11. 1 White-throated Capuchin (*Cebus hypoleucus*). Purchased.
1 Smooth-headed Capuchin (*Cebus monachus*). Purchased.
13. 1 Ring-tailed Coati (*Nasua rufa*), ♀. Presented by N. T. Williams, Esq.
6 Moorish Geckos (*Tarentola mauritanica*). Presented by Masters F. and O. Warburg.
14. 1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
15. 1 Thigh-striped Wallaby (*Halmaturus thetidis*), ♀. Deposited.
2 Herring-Gulls (*Larus argentatus*). Presented by L. V. Harcourt, Esq.
16. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Born in the Menagerie.
18. 5 White Tree-Frogs (*Hyla cærulea*). Purchased.
7 Common Gulls (*Larus canis*). Purchased.
19. 1 Owen's Apteryx (*Apteryx oweni*). Presented by Prof. T. Jeffery Parker, C.M.Z.S. See P. Z. S. 1889, p. 85.
1 Hybrid Polecat (between *Mustela putorius* and *Mustela furo*). Presented by J. Herbert B. Cowley, Esq.
21. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
1 Indian Chevrotain (*Tragulus meminna*). Presented by Mr. George Score.
22. 8 Common Swans (*Cygnus olor*). Deposited.
1 Common Buzzard (*Buteo vulgaris*). Presented by Capt. J. V. Harvey.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. Nicol.
1 Common Perch (*Perca fluviatilis*). Presented by Mr. R. Roberts.
26. 1 Short-eared Owl (*Asio brachyotus*). Presented by Mr. R. Phillips.
1 Axolotl (*Siredon mexicanus*). Presented by E. Evelyn Barron, Esq.
27. 1 Common Fox (*Canis vulpes*), ♀. Presented by the Lord Tredegar, F.Z.S.
1 American Black Bear (*Ursus americanus*), ♂. Presented by Lieuts. Hugh Williams, R.N., and Basevi, R.N., H.M.S. 'Cambridge.'
1 Common Blue Bird (*Sialia wilsoni*). Presented by Commander W. M. Latham, F.Z.S.
9 Moorish Geckos (*Tarentola mauritanica*). Presented by Masters F. and O. Warburg.
2 Golden-headed Parrakeets (*Brotogerys tui*). Purchased.

Mar. 1. 4 White-breasted Gallinules (*Gallinula phœnicura*). Purchased.
2. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss L. C. Hart.
1 Grey Ichneumon (*Herpestes griseus*). Presented by Mrs. Margaret Allison.
1 Manatee (*Manatus australis*). Purchased. See P. Z. S. 1889, p. 160.
3. 1 Unarmed Trionyx (*Trionyx muticus*). Received in Exchange.
4. 1 Hoffmann's Sloth (*Cholopus hoffmanni*). Purchased.

[illegible] ♂. Presented by [illegible] P. Z. S. 1869, p. 161.

[illegible] Purchased.

[illegible] Presented by Capt. C. A. [illegible] P. Z. S. 1869, p. 161.

[illegible] Presented by Capt. [illegible]

[illegible] Deposited.

[illegible] Deposited.

[illegible] Presented by J. Young, Esq., [illegible]

[illegible] ♂. Deposited.

[illegible] Presented by Mr. J. [illegible]

[illegible] Deposited.

[illegible] Presented by J. Young, [illegible]

[illegible] Presented by J. Young, Esq., [illegible]

[illegible] ♀. Deposited.

[illegible] Presented by Mrs. Morant.

[illegible] Deposited.

[illegible] Presented by W. H. St. [illegible]

[illegible] Purchased.

[illegible] *marginatus*). Presented [illegible]

[illegible] ♂. Presented by J. Young, [illegible]

[illegible] Presented by G. [illegible]

[illegible] *quadricornis*), ♂. Pur[illegible]

[illegible] *macrurus*), ♂. Deposited.

[illegible] *violaceus*), ♂ ♀. De[illegible]

[illegible] *ararauna*). Deposited.

[illegible] (*Phœnicopterus ignipalliatus*). [illegible]

[illegible] Born in the Menagerie.

[illegible] *molaccensis*). Presented by [illegible]

[illegible] *vulpina*). Born in the Me[illegible]

[illegible] *cristatellus*). Presented by [illegible]

[illegible] *sciurea*). Purchased.

[illegible] ♂. Purchased.

[illegible] *australis*), ♂ ♀. Pur[illegible]

[illegible] *leprosa*). Presented by F. T. [illegible]

[illegible] Butcher-bird (*Barita destructor*). Deposited.

[illegible] *teguexin*). Purchased.

[illegible] *punctatus*). Deposited.

[illegible] (*Coluber alleghaniensis*). Received in Ex[illegible]

Apr. 1. 1 Sinaitic Ibex (*Capra sinaitica*). Presented by Commander Paget, R.N. See P. Z. S. 1889, p. 246. From Mount Sinai.
1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
2. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. Cox.
1 Side-striped Jackal (*Canis lateralis*). Born in the Menagerie.
4 Black Swans (*Cygnus atratus*). Presented by Messrs. James and A. Brown.
6. 1 Raven (*Corvus corax*). Presented by J. F. Hastings, Esq., F.Z.S.
9. 1 Grey Squirrel (*Sciurus cinereus*), ♂. Presented by Miss Vokes.
1 Shag (*Phalacrocorax graculus*). Presented by Mr. Henry Reynolds.
11. 1 Kinkajou (*Cercoleptes caudivolvulus*), ♀. Presented by Mrs. Marian FitzSimons.
13. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by the West-Indian (Nat. Hist.) Exploring Commission. From St. Kitts, W. I.
1 Black Tortoise (*Testudo carbonaria*). Presented by Col. Feilden, F.Z.S. From Trinidad.
1 Rough-eyed Cayman (*Jacare sclerops*). Presented by Col. Feilden, F.Z.S.
15. 1 Wanderoo Monkey (*Macacus silenus*), ♀. Purchased.
1 Common Squirrel (*Sciurus vulgaris*). Presented by Mrs. Arthur Faulkner.
2 Viscachas (*Lagostomus trichodactylus*). Born in the Menagerie.
1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.
2 Pochards (*Fuligula ferina*), 2♂. Purchased.
16. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Caroline Newton.
17. 1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Presented by Walter Bird, Esq.
18. 1 Leopard (*Felis pardus*), ♂. Presented by George S. Mackenzie, Esq. From Malindi, East Africa.
1 Lesser Koodoo (*Strepsiceros imberbis*), ♂. Presented by George S. Mackenzie, Esq. See P. Z. S. 1889, p. 246. From Malindi, E. Africa.
2 White-crested Touracous (*Corythaix albocristata*). Presented by George S. Mackenzie, Esq.
19. 3 Elliot's Pheasants (*Phasianus ellioti*), 1♂, 2♀. Purchased.
3 Amherst's Pheasants (*Thaumalia amherstiæ*), 1♂, 2♀. Purchased.
2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ ♀. Purchased.
2 Vulturine Guinea-fowls (*Numida vulturina*), ♂ ♀. Purchased.
2 Crested Screamers (*Chauna chavaria*). Purchased.
6 Rose-coloured Pastors (*Pastor roseus*). Purchased.
20. 1 Indian Wolf (*Canis pallipes*), ♀. Presented by B. T. Ffinch, Esq., C.M.Z.S. From Afghanistan.
5 Chaplain Crows (*Corvus capellanus*). Presented by B. T. Ffinch, Esq., C.M.Z.S. From Fao, Persian Gulf.
1 Indian Python (*Python molurus*). Presented by B. T. Ffinch, Esq., C.M.Z.S.
1 Indian White Crane (*Grus leucogeranos*). Purchased.

Apr. 20. 1 Imperial Eagle (*Aquila imperialis*). Presented by Messrs. J. de la Touch and George Siemssen. From Foochow, China.
1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Presented by Mrs. Hunt.
21. 2 Alligators (*Alligator mississipiensis*), jr. Deposited.
22. 4 Concave-casqued Hornbills (*Dichoceros bicornis*), 2♂, 2♀. Deposited.
1 Crowned Hornbill (*Anthracoceros coronatus*). Deposited.
1 Nepalese Hornbill (*Aceros nepalensis*). Deposited.
1 Two-banded Monitor (*Varanus salvator*). Deposited.
23. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ ♀. Presented by J. G. Mackie, Esq.
24. 1 Long-eared Owl (*Asio otus*). Presented by Mr. Thos. B. Butler.
2 Caracals (*Felis caracal*). Presented by Capt. Treville Cookson. From Bechuanaland.
3 Orbicular Horned Lizards (*Phrynosoma orbiculare*). Presented by T. H. Collins, Esq.
26. 1 Ring-tailed Coati (*Nasua rufa*). Presented by Wm. Shiell, Esq.
2 Barbary Wild Sheep (*Ovis tragelaphus*), 2♂. Born in the Menagerie.
27. 1 Tawny Eagle (*Aquila nævioides*). Purchased. From West Africa.
1 Peacock Pheasant (*Polyplectron chinquis*), ♂. Purchased.
1 Squacco Heron (*Ardea ralloides*). Purchased.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Deposited.
28. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♀. Born in the Menagerie.
1 Derbian Wallaby (*Halmaturus derbianus*), ♀. Born in the Menagerie.
29. 2 White-eyed Ducks (*Nyroca ferruginea*), ♂ ♀. Purchased.
2 Stone Curlews (*Œdicnemus scolopax*). Presented by Mr. Brunsden.
4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
1 Persian Gazelle (*Gazella subgutturosa*), ♀. Born in the Menagerie.
30. 2 Chinchillas (*Chinchilla lanigera*). Born in the Menagerie.

May 1. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Deposited.
1 Cape Mole-Rat (*Georychus capensis*), ♀. Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1889, p. 316.
1 Geometric Tortoise (*Testudo geometrica*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
4 Tuberculated Tortoises (*Homopus femoralis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
34 Gray's Frogs (*Rana grayi*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
6 Narrow-headed Toads (*Bufo angusticeps*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Spotted Slow-worm (*Acontias meleagris*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Indian Wolf (*Canis pallipes*), ♀. Presented by Major C. S. Skipton, R.A.
1 Golden Eagle (*Aquila chrysaetus*). Presented by Mr. Thomas G. Henderson. From Inverness-shire.

May 2. 1 Puff Adder (*Vipera arietans*). Presented by F. Streatfield, Esq.
1 Brazilian Tortoise (*Testudo tabulata*). Purchased.
1 Blackish Sternothere (*Sternothærus subniger*). Purchased.
1 Egyptian Trionyx (*Trionyx ægyptiacus*). Purchased.
6 European Tree-Frogs (*Hyla arborea*). Presented by H. B. Hewetson, Esq., M.R.C.S., F.Z.S.
3. 2 Black-necked Swans (*Cygnus nigricollis*). Purchased.
2 Lineated Kaleeges (*Euplocamus lineatus*), ♂ ♀. Purchased.
6. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*), ♂. Presented by J. H. Taylor, Esq.
1 Bonte-Bok (*Alcelaphus pygargus*), ♂. Deposited.
2 Moor-Harriers (*Circus maurus*?). Received in Exchange.
2 Natterjack Toads (*Bufo calamita*). Presented by Master H. Millward.
2 Natterjack Toads (*Bufo calamita*). Presented by Master M. A. Smith.
7. 1 Otter (*Lutra vulgaris*). Presented by — Basset, Esq.
1 Long-eared Owl (*Asio otus*). Presented by the Hon. Eric Thesiger.
1 Yellow-billed Amazon (*Chrysotis panamensis*). Presented by the Lord Wm. Cecil.
8. 1 Herring-Gull (*Larus argentatus*). Presented by Mrs. Gainsford.
1 Long-eared Owl (*Asio otus*). Presented by the Rev. F. Hopkins.
9. 2 Common Kestrels (*Tinnunculus alaudarius*). Presented by Capt. Janes.
2 Common Rheas (*Rhea americana*). Presented by J. D. Kennedy, Esq.
10. 1 Black Swan (*Cygnus atratus*), ♀. Presented by Mrs. Siemens.
1 Squacco Heron (*Ardea ralloides*). Purchased.
3 Japanese Teal (*Querquedula formosa*), 1 ♂, 2 ♀. Purchased.
1 Amherst Pheasant (*Thaumalea amherstiæ*), ♂. Purchased.
11. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Dr. W. K. Sibley.
13. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Deposited.
5 North-African Jackals (*Canis anthus*). Born in the Menagerie.
1 Rough Fox (*Canis rudis*), ♂. Presented by James Coombs, Esq.
1 Mountain Ka-Ka (*Nestor notabilis*). Purchased.
14. 1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Presented by Mrs. Macnab.
1 Great Kangaroo (*Macropus giganteus*), ♂. Born in the Menagerie.
15. 2 Great Eagle-Owls (*Bubo maximus*). Presented by the Executors of the late W. J. Cookson, Esq.
1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
10 Common Vipers (*Vipera berus*). Presented by C. F. McNiven, Esq.
16. 2 Red-legged Partridges (*Caccabis rufa*). Presented by Capt. Augustus Kent, ss. 'Fez.' From the Canary Islands.
1 Green-headed Tanager (*Calliste tricolor*). Purchased.
17. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.

May 17. 6 Barbary Turtle Doves (*Turtur risorius*). Presented by Major T. Erskine Baylis, F.Z.S.
1 Black-bellied Sand-Grouse (*Pterocles arenarius*), ♂. Presented by Mrs. Ayrton Pullan.
2 Common Vipers (*Vipera berus*). Presented by Barry Burge, Esq.
18. 1 Derbian Wallaby (*Halmaturus derbianus*), ♂. Presented by Mr. Buckland, s.s. 'Britannia.'
1 Black-cheeked Falcon (*Falco melanogenys*). Presented by Baron F. von Mueller, C.M.Z.S.
1 Tuberculated Iguana (*Iguana tuberculata*). Presented by Mr. J. B. Johnson, s.s. 'Antilles.'
2 Cormorants (*Phalacrocorax carbo*). Deposited.
20. 2 Yellow-fronted Tanagers (*Euphonia flavifrons*). Presented by Mrs. Herbert.
22. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
1 Persian Gazelle (*Gazella subgutturosa*), ♀. Born in the Menagerie.
2 Bennett's Kangaroo (*Halmaturus bennetti*), 2 ♀. Born in the Menagerie.
4 Black-tailed Godwits (*Limosa ægocephala*). Purchased.
2 Manx Shearwaters (*Puffinus anglorum*). Presented by F. Hensman, Esq.
24. 1 Hog-Deer (*Cervus porcinus*), ♂. Born in the Menagerie.
2 Grey Wagtails (*Motacilla melanope*). Bred in the Menagerie.
2 Indian Muntjacs (*Cervulus muntjac*), ♂ ♀. Received in exchange.
26. 1 Ocelot (*Felis pardalis*). Purchased.
29. 1 Serval (*Felis serval*), ♂. Presented by John Walker, jun., Esq. From the Zambesi.
1 Grey Ichneumon (*Herpestes griseus*). Presented by Mrs. Walter Boden.
1 Ocelot (*Felis pardalis*), ♂. Presented by Mrs. Wolfe.
1 Red Brocket (*Cariacus rufus*?), ♀. Presented by Mrs. Wolfe.
1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*). Presented by Mrs. Wolfe.
1 Acouchy (*Dasyprocta acouchy*). Presented by Mrs. Wolfe.
1 Hairy Armadillo (*Dasypus villosus*), ♂. Presented by Mrs. Wolfe.
1 Yellow Hangnest (*Cassicus persicus*). Presented by Mrs. Wolfe.
1 Pileated Jay (*Cyanocorax pileatus*). Presented by Mrs. Wolfe.
1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by Mrs. Wolfe.
2 White-eared Conures (*Conurus leucotis*). Presented by Mrs. Wolfe.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Deposited.
1 Blue-fronted Amazon (*Chrysotis æstiva*). Deposited.
2 Yellow-headed Conures (*Conurus jendaya*). Deposited.
30. 1 Viperine Snake (*Tropidonotus viperinus*). Presented by Mr. J. Knight.
2 Poë Honey-eaters (*Prosthemadera novæ-zealandiæ*), ♂ ♀. Received in Exchange.
31. 1 Diana Monkey (*Cercopithecus diana*, var. *ignita*), ♀. Presented by Col. Wethered.

May 31. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♂. Presented by Col. Wethered.
1 Musanga Paradoxure (*Paradoxurus musanga*). Presented by Col. Wethered.
1 Nightingale (*Daulias luscinia*), ♂. Presented by J. Young, Esq., F.Z.S.
1 American Jabiru (*Mycteria americana*). Purchased.
1 American Tantalus (*Tantalus loculator*). Purchased.

June 1. 1 Bar-tailed Pheasant (*Phasianus reevesi*), ♂. Presented by C. J. Lucas, Esq.
5. 2 Australian Thicknees (*Œdicnemus grallarius*). Purchased.
1 Eyton's Tree-Duck (*Dendrocygna eytoni*). Purchased.
2 Lineolated Parrakeets (*Bolborhynchus lineolatus*). Purchased.
6. 1 Hog Deer (*Cervus porcinus*), ♀. Born in the Menagerie.
2 Mule Deer (*Cariacus macrotis*), 2 ♀. Born in the Menagerie.
7. 2 Senegal Touracous (*Corythaix persa*). Purchased.
8. 2 Elliot's Pheasants (*Phasianus ellioti*), ♂ ♀. Deposited.
10. 1 Black Lemur (*Lemur macaco*). Born in the Menagerie.
11. 1 Chattering Lory (*Lorius garrulus*). Presented by Mr. Thomas Taylor.
12. 2 Slender-billed Cockatoos (*Licmetis tenuirostris*). Presented by Dr. Seton.
2 Ducorps' Cockatoos (*Cacatua ducorpsi*). Presented by Dr. Seton.
2 Long-fronted Gerbilles (*Gerbillus longifrons*). Presented by Lieut.-Gen. Sir Harry B. Lumsden, K.C.S.I., F.Z.S.
2 Nicobar Pigeons (*Calœnas nicobarica*), ♂ ♀. Purchased.
2 Viperine Snakes (*Tropidonotus viperinus*). Presented by the Rev. F. W. Haines.
3 Green Lizards (*Lacerta viridis*). Presented by the Rev. F. W. Haines.
2 Marbled Newts (*Molge marmorata*). Presented by the Rev. F. W. Haines.
2 Spotted Salamanders (*Salamandra maculosa*). Presented by the Rev. F. W. Haines.
2 Edible Frogs (*Rana esculenta*). Presented by the Rev. F. W. Haines.
3 Green Tree-Frogs (*Hyla arborea*). Presented by the Rev. F. W. Haines.
1 Smooth Snake (*Coronella lævis*). Presented by Miss Agnes Flemyng.
13. 3 Australian Waxbills (*Estrelda temporalis*). Purchased.
14. 2 Prairie Wolves (*Canis latrans*), ♂ ♀. Presented by Chas. Martin, Esq. From the Rocky Mountains.
1 Collared Peccary (*Dicotyles tajaçu*). Purchased.
2 Razorbills (*Alca torda*). Presented by Dr. B. Hewetson, F.Z.S.
1 Cocoa-nut Land-Crab (*Birgus latro*), ♂. Presented by Commander Alfred Carpenter, R.N. See P. Z. S. 1889, p. 393.
15. 1 Axis Deer (*Cervus axis*), ♀. Born in the Menagerie.
3 New-Zealand Parrakeets (*Cyanorhamphus novæ-zealandiæ*). Received in exchange.
17. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Capt. M. S. Rinch.
1 Grey Parrot (*Psittacus erithacus*). Presented by Miss L. Davy.
18. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by W. J. McCausland, Esq.

June 18. 1 Yak (*Poephagus grunniens*), ♀. Born in the Menagerie.
1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.
1 Red-legged Partridge (*Caccabis rufa*). Presented by J. E. Clayton, Esq.
1 Redwing (*Turdus iliacus*). Presented by J. E. Clayton, Esq.
1 Purple-crested Touracou (*Corythaix porphyreolophus*). Presented by Miss Dolly Kirk.
1 Bolle's Pigeon (*Columba bollii*). Bred in the Menagerie.
1 Triangular-spotted Pigeon (*Columba guinea*). Bred in the Menagerie.
19. 1 Specious Pigeon (*Columba speciosa*). Purchased.
1 Black Francolin (*Francolinus vulgaris*). Purchased.
1 Hawk's-billed Turtle (*Chelone imbricata*). Purchased.
20. 2 Canary Finches (*Serinus canarius*), ♂ ♀. Presented by E. J. Meade-Waldo, Esq.
2 Tintillon Chaffinches (*Fringilla tintillon*). Presented by E. J. Meade-Waldo, Esq.
2 Bolle's Pigeons (*Columba bollii*). Deposited.
21. 1 Pallas's Sand-Grouse (*Syrrhaptes paradoxus*), ♂. Deposited.
1 Herring-Gull (*Larus argentatus*). Bred in the Menagerie.
1 Yellow-legged Herring-Gull (*Larus cachinnans*). Bred in the Menagerie.
22. 1 Solitary Thrush (*Monticola cyanus*). Presented by the Rev. H. A. Macpherson.
1 Alexandrine Parrakeet (*Palæornis alexandri*). Presented by Miss Wilson.
4 Violaceous Night-Herons (*Nycticorax violaceus*). Presented by Dr. A. P. Boon, C.M.Z.S.
1 Common Trumpeter (*Psophia crepitans*). Presented by C. C. Tudway, Esq.
23. 1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.
24. 1 Black-headed Lemur (*Lemur brunneus*), ♂. Presented by Mr. Chas. C. Stewart.
25. 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Master W. P. Teil.
1 Ring-necked Parrakeet (yellow variety) (*Palæornis torquatus*). Presented by Col. C. Swinhoe, F.Z.S.
26. 1 Thar (*Capra jemlaica*). Born in the Menagerie.
4 Angora Goats (*Capra hircus*, var.), 1 ♂, 3 ♀. Presented by Messrs. Theophilus, Bros.
27. 3 American Wild Turkeys (*Meleagris gallopavo*). Bred in the Menagerie.
28. 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by Philip Lemberg, Esq.
1 Flocky Lemur (*Avahis laniger*). Purchased.
2 Mule Deer (*Cariacus macrotis*), 2 ♂. Born in the Menagerie.
29. 2 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Purchased.
2 Goshawks (*Astur palumbarius*). Deposited.

July 1. 2 Indian Jerboas (*Alactaya indica*). Presented by Cuthbert Johnson, Esq.
1 Bonnet-Monkey, white variety (*Macacus sinicus*), ♀. Presented by The Waterbury Watch (Sales) Co. Ld.
1 African Wild Ass (*Equus tæniopus*), ♀. Born in the Menagerie.

July 2. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♀. Presented by Capt. Stewart Stephens.
1 Brown Bear (*Ursus arctos*), ♀. Presented by John Foster Spence, Esq.
1 Polar Bear (*Ursus maritimus*), ♀. Presented by Arnold Pike, Esq. From Spitzbergen.
1 Short Python (*Python curtus*). Presented by Mrs. Bertha M. L. Bonser. See P. Z. S. 1889, pp. 393, 432, Plate XLV.
1 Hybrid Wild Swine (between *Sus scrofa* and *Sus domesticus*), ♀. Presented by Ralph Banks, Esq., F.Z.S.
3. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.
12 Algerian Skinks (*Eumeces algeriensis*). Purchased.
5. 2 Wonga-Wonga Pigeons (*Leucosarcia picata*). Received in Exchange.
1 Red-winged Parrakeet (*Aprosmictus erythropterus*), ♀. Received in Exchange.
2 Barnard's Parrakeets (*Platycercus barnardi*). Purchased.
1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Presented by Sir Edmund A. H. Lechmere, Bart., M.P.
7. 5 Violaceous Night-Herons (*Nycticorax violaceus*). Presented by Dr. A. P. Boon, C.M.Z.S. From St. Kitts, W. I.
9. 1 Poë Honey-eater (*Prosthemadera novæ-zealandiæ*). Presented by Alfred M. Simon, Esq.
1 Military Macaw (*Ara militaris*). Deposited.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
1 White-throated Monitor (*Varanus albogularis*). Presented by H. L. Jones, Esq.
12. 1 Indian Coucal (*Centropus rufipennis*). Received in Exchange.
2 Diamond Snakes (*Morelia spilotes*). Deposited.
2 Argus Pheasants (*Argus giganteus*), ♂ ♀. Purchased.
14. 2 Razorbills (*Alca torda*). Presented by Mr. W. B. Roberts.
3 Guillemots (*Uria troile*). Presented by Mr. W. B. Roberts.
15. 2 Crested Porcupines (*Hystrix cristata*). Presented by Capt. Henry F. Hoste, R.M.S. 'Trojan.'
1 Jackal-Buzzard (*Buteo jacal*). Presented by Capt. Henry F. Hoste, R.M.S. 'Trojan.'
2 Natal Francolins (*Francolinus natalensis*), ♂ ♀. Presented by Capt. Henry F. Hoste, R.M.S. 'Trojan.'
2 Ocellated Mantises (*Harpax ocellata*). Presented by Col. J. H. Bowker, F.Z.S.
16. 1 Peacock Pheasant (*Polyplectron chinquis*). Bred in the Menagerie.
17. 8 Mandarin Ducks (*Æx galericulata*). Bred in the Menagerie.
5 Summer Ducks (*Æx sponsa*). Bred in the Menagerie.
2 Chiloe Wigeon (*Mareca chiloensis*). Bred in the Menagerie.
6 Chilian Pintail (*Dafila spinicauda*). Bred in the Menagerie.
3 Australian Wild Ducks (*Anas superciliosa*). Bred in the Menagerie.
20. 1 Common Wolf (*Canis lupus*). Presented by W. S. Lart, Esq. From Spain.
4 Violaceous Night-Herons (*Nycticorax violaceus*). Presented by Dr. P. A. Boon, C.M.Z.S. From St. Kitts, W. I.
1 Green Bittern (*Butorides virescens*). Presented by Dr. A. P. Boon, C.M.Z.S. From St. Kitts, W. I.

July 20. 1 Dominican Kestrel (*Tinnunculus dominicensis*). Presented by Dr. A. P. Boon, C.M.Z.S. From St. Kitts, W. I.
1 Porto-Rico Pigeon (*Columba corensis*). Presented by Dr. A. P. Boon, C.M.Z.S. From St. Kitts, W. I.
21. 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Menagerie.
22. 2 White Storks (*Ciconia alba*). Presented by Thos. Hay, Esq.
3 Well-marked Tortoises (*Homopus signatus*), 1 ♂, 2 ♀. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
4 Rufescent Snakes (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Many-spotted Snake (*Psammophylax multimaculatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Spotted Slowworm (*Acontias meleagris*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Puff-Adder (*Vipera arietans*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
23. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. F. Dabbs.
1 Common Zebra (*Equus zebra*), ♀. Received in Exchange.
1 Prêtre's Amazon (*Chrysotis prêtrei*). Purchased. See P. Z. S. 1889, p. 394.
1 Tovi Parrakeet (*Brotogerys tovi*). Deposited.
1 Tesselated Snake (*Tropidonotus tessellatus*). Presented by H. D. Brocklehurst, Esq.
1 Leopardine Snake (*Helicops leopardinus*). Purchased.
24. 2 Crested Pigeons (*Ocyphaps lophotes*). Bred in the Menagerie.
2 Common Toads (*Bufo vulgaris*). Presented by Dr. J. J. Pitcairn, F.Z.S.
1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.
25. 1 White-throated Capuchin (*Cebus hypoleucus*), ♂. Purchased.
1 Peba Armadillo (*Tatusia peba*), ♂. Purchased.
1 Senegal Touracou (*Corythaix persa*). Purchased.
1 Tesselated Snake (*Tropidonotus tessellatus*). Purchased.
26. 2 Black-eared Marmosets (*Hapale penicillata*). Deposited.
1 Common Otter (*Lutra vulgaris*). Presented by Chas. H. Wynn, Esq.
6 Spotted Tinamous (*Nothura maculosa*). Purchased.
28. 2 Mule Deer (*Cariacus macrotis*), 2 ♂. Born in the Menagerie.
29. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by H. J. Cunnington, Esq.
1 Peregrine Falcon (*Falco peregrinus*). Presented by Capt. Watson.
31. 3 Palm-Squirrels (*Sciurus palmarum*). Purchased.
10 Gold Pheasants (*Thaumalea picta*). Bred in the Menagerie.

Aug. 1. 1 Indian Fruit-Bat (*Pteropus medius*), ♀. Presented by Mr. Tholen.
3. 1 Ocelot (*Felis pardalis*). Presented by Capt. W. Heathorn Lacy.
1 Brazilian Cariama (*Cariama cristata*). Presented by Capt. W. Heathorn Lacy.
4. 1 Tuberculated Iguana (*Iguana tuberculata*, jr.). Presented by H. E. Blandford, Esq.
1 Indian Python (*Python molurus*). Deposited.
5. 1 Gazelle (*Gazella dorcas*), ♂. Presented by Umberto Arbib, Esq.
2 Triangular-spotted Pigeons (*Columba guinea*). Bred in the Menagerie.

Aug. 5. 2 Cambayan Turtle-Doves (*Turtur senegalensis*). Bred in the Menagerie.
1 Globose Curassow (*Crax globicera*). Hatched in the Menagerie.
6. 1 Cinereous Vulture (*Vultur monachus*). Deposited.
1 Cinereous Vulture (*Vultur monachus*). Presented by the Lord Lilford, F.Z.S.
2 Vinaceous Turtle-Doves (*Turtur vinaceus*). Presented by Mrs. Ffoulkes.
22 Gold Fish (*Carassius auratus*). Presented by A. H. Hastie, Esq.
4 Carp (*Cyprinus carpio*). Presented by A. H. Hastie, Esq.
7. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
8. 2 Alligators (*Alligator mississippiensis*). Presented by W. J. Bannehr, Esq.
9. 24 Teydean Chaffinches (*Fringilla teydea*). Deposited.
15. 1 Great-billed Touracou (*Corythaix macrorhyncha*). Presented by Lady Charlotte Brandford Griffith.
17. 1 Water-Chevrotain (*Hyomoschus aquaticus*). Purchased.
18. 1 Blue-and-Yellow Macaw (*Ara ararauna*). Deposited.
19. 1 Peregrine Falcon (*Falco peregrinus*). Presented by W. Hond, Esq., M.D.
1 Mantchurian Crane (*Grus viridirostris*). Purchased.
20. 1 Royal Python (*Python regius*). Received in Exchange.
5 African Lepidosirens (*Protopterus annectens*). Purchased.
23. 9 Spanish Blue Magpies (*Cyanopolius cooki*). Deposited.
8 Spanish Blue Magpies (*Cyanopolius cooki*). Presented by the Lord Lilford, F.Z.S.
1 Formosa Deer (*Cervus taëvanus*), ♂. Presented by Capt. C. Taylor, s.s. 'Aberdeen.'
1 Japanese Deer (*Cervus sika*), ♀. Presented by Capt. C. Taylor, s.s. 'Aberdeen.'
2 Three-striped Paradoxures (*Paradoxurus trivirgatus*). Presented by Capt. C. Taylor, s.s. 'Aberdeen.'
1 Great Eagle Owl (*Bubo maximus*). Presented by Capt. C. Taylor, s.s. 'Aberdeen.'
1 Bewick's Swan (*Cygnus bewicki*). Presented by Mr. Jansen. From China.
24. 1 Common Fox (*Canis vulpes*), ♀. Presented by Edw. C. Hall, Esq.
25. 1 Indian Muntjac (*Cervulus muntjac*), ♂. Born in the Menagerie.
2 Water Rattlesnakes (*Crotalus adamanteus*). Deposited.
1 Mocassin Snake (*Tropidonotus fasciatus*). Deposited.
27. 1 Common Peafowl (white variety) (*Pavo cristatus*), ♂. Presented by Richard Hunter, Esq.
1 Manx Shearwater (*Puffinus anglorum*). Presented by John M. Wood, Esq., C.E.
28. 1 Lesser Razor-billed Curassow (*Mitua tomentosa*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
29. 5 Herring-Gulls (*Larus argentatus*). Presented by Sir Richard Nicholson.
1 Louisianian Meadow-Starling (*Sturnella ludoviciana*), ♀. Presented by J. Newton Hayley, Esq.
31. 1 Turtle-Dove (*Turtur communis*). Presented by C. W. Cousins, Esq.

Sept. 2. 3 Bengal Foxes (*Canis bengalensis*). Presented by Col. Creek.

Sept. 2. 1 Common Badger (*Meles taxus*). Presented by G. H. Hulme, Esq.

3. 1 Common Marmoset (*Hapale jacchus*). Presented by James Waddell, Esq.
1 Red-billed Tree-Duck (*Dendrocygna autumnalis*). Presented by Mrs. Alfred Oakes.
2 Upland Geese (*Bernicla magellanica*, var. *dispar*), ♂ ♀. Purchased.

4. 2 Spur-winged Geese (*Plectropterus gambensis*). Purchased.
2 Black-backed Geese *Sarcidiornis melanonota*). Purchased.

5. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Miss Colvin.
1 Crested Porcupine (*Hystrix cristata*). Presented by Capt. Rose.
1 Ringed Plover (*Ægialitis hiaticula*). Presented by H. M. Upcher, Esq., F.Z.S.

6. 5 Hobbies (*Falco subbuteo*). Deposited. From Spain.

9. 1 Crested Porcupine (*Hystrix cristata*). Presented by Chas. Clifton, Esq., F.Z.S.
2 Nicobar Pigeons (*Calœnas nicobarica*). Presented by Chas. Clifton, Esq., F.Z.S.

10. 2 Æthiopian Wart-Hogs (*Phacochœrus æthiopicus*), ♂ ♀. Deposited.

11. 1 Sinaitic Ibex (*Capra sinaitica*), ♂. Presented by Sir James Anderson. From the Erba Mountains, near Suakim.
2 Rose-crested Cockatoos (*Cacatua moluccensis*). Presented by Chas. Clifton, Esq., F.Z.S.
1 Fork-tailed Jungle-fowl (*Gallus varius*), ♂. Presented by Chas. Clifton, Esq., F.Z.S
4 European Sousliks (*Spermophilus citillus*). Presented by E. Dance, Esq.

13. 1 Cape Zorilla (*Ictonyx zorilla*). Presented by Capt. W. W. Besant. From Suakim.
1 Osprey (*Pandion haliaëtus*). Purchased.
1 Vinous-throated Fruit-Pigeon (*Carpophaga rufigula*). Presented by C. M. Woodford, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Tupper.

14. 1 Wood-Owl (*Syrnium aluco*). Presented by Major Vilett Rolleston, F.Z.S.

15. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.

17. 1 White-fronted Lemur (*Lemur albifrons*), ♂. Presented by C. O. Pelly, Esq.
3 African Lepidosirens (*Protopterus annectens*). Deposited.

18. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mr. H. B. Wedlake.
1 Brown Bear (*Ursus arctos*). Presented by Frank Dugdale, Esq.
4 Larger Tree-Ducks (*Dendrocygna major*). Purchased.
3 Indian Tree-Ducks (*Dendrocygna javanica*). Purchased.

19. 1 Crested Porcupine (*Hystrix cristata*). Presented by Mrs Lucas-Shadwell.
1 Red Kangaroo (*Macropus rufus*), ♂. Born in the Menagerie.
2 Cockateels (*Calopsitta novæ-hollandiæ*). Bred in the Menagerie.
1 Crested Pigeon (*Ocyphaps lophotes*). Bred in the Menagerie.
1 Nicobar Pigeon (*Calœnas nicobarica*). Bred in the Menagerie.

Sept. 20. 1 Burchell's Zebra (*Equus burchelli*), ♀. Purchased.
1 Tuberculated Iguana (*Iguana tuberculata*). Purchased.
23. 2 Common Cassowaries (*Casuarius galeatus*). Deposited.
24. 2 Black-footed Penguins (*Spheniscus demersus*). Presented by Harding Cox, Esq., F.Z.S.
6 Californian Quails (*Callipepla californica*), 2 ♂, 4 ♀. Purchased.
25. 1 Himalayan Bear (*Ursus tibetanus*), ♂. Deposited.
4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
26. 1 Red-handed Tamarin (*Midas rufimanus*). Presented by Miss Gladys E. Meyrick.
1 Common Pintail (*Dafila acuta*), ♂. Presented by R. Terrot, Esq.
27. 1 Peregrine Falcon (*Falco peregrinus*). Presented by J. T. Taylor, Esq.
28. 1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.
1 Californian Quail (*Callipepla californica*), ♂. Received in Exchange.
1 Virginian Colin (*Ortyx virginianus*), ♂. Received in Exchange.
1 Malaccan Parrakeet (*Palæornis longicauda*), ♂. Received in Exchange.
1 Malabar Parrakeet (*Palæornis columboides*), ♂. Received in Exchange.
30. 1 Mealy Amazon (*Chrysotis farinosa*). Received in Exchange.

Oct. 1. 2 Cape Crowned Cranes (*Balearica chrysopelargus*). Presented by the Hon. Mrs. Barker.
2. 7 Common Slowworms (*Anguis fragilis*). Presented by Miss Alice Leonora Pelly.
3. 4 Common Rheas (*Rhea americana*). Purchased.
4. 1 Jelerang Squirrel (*Sciurus bicolor*). Presented by Fred. Smith, Esq.
5. 1 Royal Python (*Python regius*). Deposited.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by J. Watkins, Esq.
6. 1 Long-nosed Crocodile (*Crocodilus cataphractus*). Presented by John Richard Holmes, Esq.
7. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Deposited.
2 Black Storks (*Ciconia nigra*). Purchased.
2 Mantchurian Crossoptilons (*Crossoptilon mantchuricum*). Purchased.
8. 2 Spur-winged Geese (*Plectropterus gambensis*). Deposited.
2 Black-headed Lemurs (*Lemur brunneus*). Deposited.
9. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.
11. 2 Common Marmosets (*Hapale jacchus*). Presented by Mr. Stanley Gibson.
12. 1 Palm-Squirrel (*Sciurus palmarum*). Presented by W. Tweedie, Esq.
1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mrs. E. Reeves.
13. 1 Canadian Beaver (*Castor canadensis*). Presented by J. R. Politzer, Esq., F.Z.S.
1 Puma (*Felis concolor*). Born in the Menagerie.
14. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ ♀. Deposited.
1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by Mrs. Cosh.

Oct. 14. 1 Black-fronted Lemur (*Lemur nigrifrons*). Deposited.
2 Well-marked Tortoises (*Homopus signatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Rufescent Snake (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3 Smooth-bellied Snakes (*Homalosoma lutrix*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Rhomb-marked Snake (*Psammophylax rhombeatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Cape Adder (*Vipera atropos*). Presented by Rev. G. H. R. Fisk, C.M.Z.S.
4 Warty Short-headed Toads (*Breviceps verrucosus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Humped short-headed Toad (*Breviceps gibbosus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
15. 3 Common Hedgehogs (*Erinaceus europæus*). Presented by H. Pelham Curtis, Esq.
2 Cayenne Aracaris (*Pteroglossus aracari*). Presented by Thos. Watson Permain, Esq. From Maceyo, Brazil.
17. 6 Common Cormorants (*Phalacrocorax carbo*). Deposited.
19. 1 Red-necked Hawk (*Micrastur ruficollis*). Presented by J. E. Wolfe, Esq.
1 Red-and-Blue Macaw (*Ara macao*). Presented by Robert Romer, Esq., Q.C.
21. 2 Reed-Buntings (*Emberiza schæniclus*), ♂ ♀. Purchased.
23. 1 Gaur (*Bibos gaurus*), ♂. Presented by Sir Cecil C. Smith, K.C.M.G. See P. Z. S. 1889, p. 447. From Pahang, Malay Peninsula.
24. 1 Fournier's Capromys (*Capromys pilorides*). Purchased.
1 Three-coloured Lory (*Lorius tricolor*). Purchased.
25. 3 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*). Presented by Mr. A. Baker.
26. 3 Dingo Dogs (*Canis dingo*), 2 ♂, 1 ♀. Received in Exchange.
1 White Goshawk (*Astur novæ-hollandiæ*). Received in Exchange.
1 Berigora Hawk (*Hieracidea berigora*). Received in Exchange.
1 Brush-Turkey (*Talegalla lathami*), ♀. Received in Exchange.
1 Australian Thicknee (*Œdicnemus grallarius*). Received in Exchange.
28. 2 Tuatera Lizards (*Sphenodon punctatus*). Presented by Rear-Admiral Henry Fairfax, R.N., C.B., F.Z.S.
2 Short-toed Larks (*Calandrella brachydactyla*). Presented by Commander W. M. Latham, R.N., F.Z.S. From Devonshire.
29. 1 Ring-tailed Coati (*Nasua rufa*). Presented by W. J. Martin, Esq.
1 Sharp-nosed Crocodile (*Crocodilus acutus*). Presented by the Jamaica Institute, Jamaica, W.I.
30. 1 Collared Peccary (*Dicotyles tajacu*), ♀. Deposited.
31. 1 Patas Monkey (*Cercopithecus patas*), ♂. Presented by the Rev. James Vernall.
3 Grey Squirrels (*Sciurus cinereus*). Deposited.
1 Cheetah (*Cynælurus jubatus*), ♀. Presented by Captain Webster.

Nov. 1. 4 Rosy-billed Ducks (*Metopiana peposaca*), 2 ♂, 2 ♀. Purchased.

Nov. 1. 4 Dwarf Finches (*Spermestes nana*). Purchased.
2. 1 Smooth-headed Capuchin (*Cebus monachus*), ♂. Deposited.
4. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mrs. Charles Sainsbury.
1 Rhesus Monkey (*Macacus rhesus*), ♂ Presented by Col. Cuthbert Larking.
2 Common Siskins (*Chrysomitris spinus*), ♂ ♀. Purchased.
2 Twites (*Linota flavirostris*). Purchased.
2 Lesser Redpolls (*Linota rufescens*). Purchased.
1 Crested Pelican (*Pelecanus crispus*). Deposited.
2 White Pelicans (*Pelecanus onocrotalus*, jr.). Deposited.
2 Knots (*Tringa canutus*). Purchased.
1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.
5. 1 Common Boa (*Boa constrictor*). Deposited.
1 Neck-marked Snake (*Geoptyas collaris*). Purchased.
6. 1 Hairy-rumped Agouti (*Dasyprocta prymnolopha*). Presented by Henry E. Blanford, Esq.
1 Northern Mocking-bird (*Mimus polyglottus*), ♂. Presented by Miss E. H. Breton.
1 Moccasin Snake (*Tropidonotus fasciatus*). Deposited.
7. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mr. James T. Wilson.
8. 1 Rosy-billed Duck (*Metopiana peposaca*), ♂. Purchased.
9. 1 Common Polecat (*Mustela putorius*). Presented by the Earl of Romney.
4 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
11. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Miss B. Tatham.
12. 1 Dwarf Chameleon (*Chamæleon pumilus*). Presented by Mrs. Leith.
1 Green Lizard (*Lacerta viridis*). Presented by Mr. C. H. Whitlow.
13. 1 Common Stoat (*Mustela erminea*). Presented by Cuthbert Johnson, Esq.
1 Redshank (*Totanus calidris*). Presented by R. M. J. Teil, Esq.
14. 1 Wattled Crane (*Grus carunculata*). Presented by Robert Sinclair, jr., Esq.
15. 1 Common Marmoset (*Hapale jacchus*). Presented by O. Burrell, Esq.
1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by W. H. Felstead, Esq.
16. 1 Common Jay (*Garrulus glandarius*). Purchased.
1 Grey-headed Porphyrio (*Porphyrio polycephalus*). Presented by Dr. Gerard Smith.
5 Carpet Snakes (*Morelia variegata*). Received in Exchange.
17. 1 Common Chameleon (*Chamæleon vulgaris*). Presented by G. W. Alder, Esq.
18. 1 Golden-naped Amazon (*Chrysotis auripalliata*). Purchased.
19. 1 Barbary Ape (*Macacus inuus*), ♂. Presented by Capt. Augustus Kent.
1 Saker Falcon (*Falco sacer*). Presented by Capt. Augustus Kent.
20. 2 Fieldfares (*Turdus pilaris*). Presented by J. Young, Esq., F.Z.S.
21. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Dr. Messiter Lang.

Nov. 23. 1 Molucca Deer (*Cervus moluccensis*). Born in the Menagerie.
25. 1 Prevost's Squirrel (*Sciurus prevosti*). Purchased.
1 Roebuck (*Capreolus capræa*), ♂. Purchased.
1 Stanleyan Chevrotain (*Tragulus stanleyanus*). Purchased.
1 White-faced Tree-Duck (*Dendrocygna viduata*). Purchased.
1 Hawk-billed Turtle (*Chelone imbricata*). Purchased.
2 Indian Cobras (*Naia tripudians*). Purchased.
1 Annulated Snake (*Leptodira annulata*). Purchased.
1 European Bison (*Bison bonasus*), ♂. Deposited.
26. 1 Arctic Fox (*Canis lagopus*). Presented by Stuart N. Corlett, Esq.
2 Crested Pigeons (*Ocyphaps lophotes*). Bred in the Menagerie.
1 Curlew (*Numenius arquata*). Purchased.
27. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Col. J. D. C. Farrell.
1 Corn-Crake (*Crex pratensis*). Presented by Mr. Bibby.
28. 4 Black-necked Swans (*Cygnus nigricollis*). Purchased.
29. 4 Common Snakes (*Tropidonotus natrix*). Presented by the London, Chatham, and Dover Railway Company.
30. 2 Common Marmosets (*Hapale jacchus*). Presented by Mr. Charles Petrzywalski.

Dec. 3. 1 American Bison (*Bison americanus*), ♂. Born in the Menagerie.
1 Mexican Deer (*Cariacus mexicanus*?), ♂. Presented by H. Berkeley James, Esq., F.Z.S.
4. 1 Common Squirrel (*Sciurus vulgaris*). Presented by W. Aubrey Chandler, Esq.
1 Malayan Bear (*Ursus malayanus*), ♂. Presented by Capt. Bason.
1 Gold Pheasant (*Thaumalea picta*), ♀. Presented by Capt. Bason.
6. 1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Deposited.
9. 1 Ring-tailed Coati (*Nasua rufa*), ♂. Presented by Mrs. Petre.
1 Short-eared Owl (*Asio brachyotus*). Presented by E. Hart, Esq., F.Z.S.
10. 5 Rhesus Monkeys (*Macacus rhesus*), 2♂, 3♀. Deposited.
1 Common Squirrel (*Sciurus vulgaris*). Presented by S. Stutterd, Esq.
2 Owen's Apteryx (*Apteryx owenî*). Presented by Capt. C. A. Findlay, R.N.R., R.M.S.S. 'Ruapehu.'
13. 1 Chestnut-fronted Troupial (*Agelæus frontalis*). Received in Exchange.
1 Marsh-Ichneumon (*Herpestes galera*), ♂. Purchased.
15. 4 Common Vipers (*Vipera berus*). Presented by W. H. B. Pain, Esq.
16. 2 Viscachas (*Lagostomus trichodactylus*), ♂♀. Presented by Thos. Taylor, Esq. From Entre Rios, Argentine Republic.
17. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Wm. F. Hughes, Esq.
18. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♀. Presented by Lawson N. Peregrine, Esq.
1 Black Wallaby (*Halmaturus ualabatus*), ♂. Deposited.
2 Crimson-winged Parrakeets (*Aprosmictus erythropterus*), ♂♀. Presented by Mrs. G. Byng-Payne.
20. 3 Syrian Squirrels (*Sciurus syriacus*). Deposited.

Dec. 20. 2 Black-and-White Geese (*Anseranas melanoleuca*). Deposited.
23. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mr. James Entwistle.
27. 3 Common Bluebirds (*Sialia wilsoni*), 1♂, 2♀. Presented by Commander W. M. Latham, R.N., F.Z.S.
1 Ring-tailed Coati (*Nasua rufa*). Purchased.
28. 1 Malabar Parrakeet (*Palæornis columboides*?). Presented by J. E. Godfrey, Esq.
30. 1 Brown Capuchin (*Cebus fatuellus*), ♂. Presented by J. H. Bostock, Esq.
31. 2 Schlegel's Doves (*Chalcopelia puella*). Presented by Major C. M. MacDonald, H.L.I.
1 Common Gull (*Larus canus*). Presented by Mr. E. Keilich.
1 Black-headed Gull (*Larus ridibundus*). Presented by Mr. E. Keilich.

INDEX.

Abraxas
ditritaria, 431.
fasciatia, 432.
irrorataria, 430.
luteolaria, 430.
ostrina, 431.
poliaria, 431.
todara, 431, 432.
Abrostola
niveola, 480.
transfixa, 534.
triplasia, 534.
urentis, 535.
Acanthias
vulgaris, 321, 322.
Acanthodrilus
annectens, 378.
antarcticus, 378.
dissimilis, 377, 378.
multiporus, 378.
novæ zelandiæ, 377, 378.
rosæ, 377, 379.
Acantholipes
metalligera, 528.
Aceros
nepalensis, 587, 588, 590, 591.
Achatina
barriana, 579, 582.
linteræ, 580, 582.
smithi, 579, 582.
Acontia
albonitens, 522.
arefacta, 523.
bicolora, 524.
biplaga, 523.
biplagiata, 523.
costalis, 410.
karachiensis, 410.
noloides, 523.
pulchella, 524, 571.
signifera, 523.
subfixa, 523.
Acontia
vialis, 523.
Acrocephalus
orientalis, 224.
Acronotus
annularis, 618.
Acronycta
alni, 477.
brumosa, 476.
consanguis, 476.
cuspis, 474.
digna, 475.
herculea, 475.
increta, 475.
leporina, 477.
leucocuspis, 474.
ligustri, 476.
longa, 478.
lutea, 478.
luteicoma, 475.
major, 476.
menyanthidis, 476.
michaëli, 475.
pruinosa, 476.
psi, 475.
rumicis, 477.
strigosa, 478.
subornata, 477, 571.
tridens, 475.
Acryllium
vulturina, 371.
Actias
luna, 86.
selene, 86.
Actinocucumis
typica, 7.
Adris
tyrannus, 544.
Ægialitis
cantiana, 225.
dubia, 225.
geoffroyi, 225.
mongolica, 225.
peroni, 225.
Ægithina
viridis, 226.
Ægithus
armitagei, 619.
bartletti, 619, 620.
dichrous, 619, 620.
Æolosoma
ehrenbergii, 51, 55, 56.
headleyi, 51, 52.
leidyi, 51.
quaternarium, 51, 55, 56.
stokesi, 51.
tenebrarum, 51, 52, 53, 54, 55, 56.
variegatum, 52, 55, 56.
Ærope
caffra, 327.
Æthopyga
shelleyi, 225.
Æthriamanta
brevipennis, 298.
rezia, 297, 298.
Aëtobatis
narinari, 244.
Aginna
levicula, 417, 432.
robustalis, 418.
Agriopis
aprilina, 503.
viridis, 502, 571.
Agrophila
sulphuralis, 528.
trabealis, 528.
Agrotis
aversa, 499.
bremeri, 501.
corticea, 499.
depravata, 499.
dilucida, 541.
exclamationis, 500.
fucosa, 499.
illobata, 498.
informis, 500, 571.

Agrotis
informis, var. *confluens*, 500.
ingrata, 500.
lucens, 501.
lycarum, 501.
obscura, 500.
odiosa, 513.
præcox, 499.
quadrisigna, 498.
ravida, 500.
saucia, 499.
segetum, 499.
—, var. *ingrata*, 499.
senna, 501.
speciosa, 501.
squalida, 501.
suffusa, 499.
tokionis, 499.
undosa, 501, 571.
ustulata, 537.
Alaria
gauræ, 86.
Alburnus
alburnus, 50.
Alca
torda, 170.
Alcedo
asiatica, 226.
bengalensis, 225.
Alcippe
cinerea, 364.
kilimensis, 356, 364.
Alepidosaurus
ferox, 324.
Aleta
formosana, 482.
Allolobophora
annulata, 377.
fœtida, 377.
Aloa
insolata, 404, 432.
lactinea, 404, 405.
sanguinolenta, 404.
sara, 404.
Alopecias
vulpes, 243.
Alyceus
everetti, 347, 355.
galbanus, 346, 355.
globosus, 346, 355.
graphicus, 347.
hochstetteri, 346.
hosei, 347, 355.
otiphorus, 347.
specus, 347, 355.
spiracellum, 346, 355.
Alysia
grisea, 486.
Amblygoes
albinotata, 570.
Amblygoes
cinerea, 555.
Amblyornis
musgravii, 451.
subalaris, 451.
Amblyscelis
ferruginea, 615.
natalensis, 615.
Ameiva
surinamensis, 465.
Amphipyra
corvina, 540.
crebina, 540.
jankowskii, 540.
largeteaui, 541.
livida, 540.
magna, 539.
monolitha, 539.
perflua, 540.
pyramidea, 539.
—, var. *obscura*, 539.
schrenkii, 540.
surnia, 539.
tripartita, 540.
Amphisbæna
darwinii, 609, 612.
fuliginosa, 604.
Amphistomum
truncatum, 321.
Amyna
cephusalis, 492.
stellata, 493.
Anabyster
calabaricus, 196.
Anarta
gemmifera, 480.
Anas
erythrorhynchus, 371.
Anaulus
bombycinus, 350.
Anax
striatus, 297, 299.
Anchomenus
(Agonum) *mesostictus*, 215.
Anguilla
vulgaris, 327.
Anophia
mosara, 413.
olivascens, 413.
Anous
stolidus, 225.
Anthenea
acuta, 6.
pentagonula, 6.
Antheræa
menippe, 86.
mylitta, 86, 87.
Anthias
cichlops, 151.
formosus, 238.
Anthias
margaritaceus, 238.
pleurotænia, 151, 153.
Anthodiæta
collaris, 366.
hypodila, 366.
zambesiana, 366.
Anthœcia
vigillata, 523.
Anthophila
obliterata, 520, 521.
wimmerii, 520.
Anthothreptes
hypodila, 366.
longuemarii, 366.
orientalis, 366.
Anthraceros
malayanus, 590.
Anthracoceros
leniprieri, 226.
Anthreptes
hypodila, 366.
longuemarii, 366.
malaccensis, 226.
orientalis, 366.
zambesiana, 366.
Anthrophila
ænea, 521.
hæmorrhoida, 521.
hebescens, 521.
hemirhoda, 521.
paradisea, 521.
roseifascia, 521.
semipurpurea, 521.
Anthropopithecus
calvus, 1, 316.
troglodytes, 1.
Anthus
gustavi, 224.
maculatus, 224.
Antilope
decula, 220.
triangularis, 74, 75.
Anuropsis
cinereiceps, 226.
Aonyx
delalandi, 196.
horsfieldi, 195.
indigitata, 195.
leptonyx, 195.
sikimensis, 195.
Apamea
askoldis, 490.
basilinea, 489.
conciliata, 489.
gemina, 489.
leucostigma, 485.
limbata, 490.
minima, 410.
nivalis, 490.
repetita, 489.

Apatura
iris, 86.
Aphareus
rutilans, 245.
Aphthona
regulata, 275.
Aplecta
herbida, 508.
nebulosa, 508.
occulta, 508.
Aplectoides
caliginea, 510.
nitida, 510.
Apogon
bifasciatus, 244.
maximus, 244.
tæniatus, 238.
Appias
hippoides, var. *epicœna*, 398.
Appopestes
inconspicua, 541.
phantasma, 541.
Aptenodytes
chrysocome, 84.
Apteryx
oweni, 85, 161.
Aquila
imperialis, 79.
Arachnothera
dilutior, 226.
Archicorax
albicollis, 368.
Arcte
senica, 548.
Arctictis
binturong, 223.
Ardea
cinerea, 220.
sumatrana, 225.
Argynnis
paphia, 86.
Arius
baroni, 206, 207.
bartonensis, 201, 205, 206.
crassus, 206, 207.
egertoni, 204, 205, 206.
gagorides, 203, 204, 205, 207.
Artamides
sumatrensis, 226.
Artamus
leucorhynchus, 224.
Asphæra
abbreviata, 270.
albida, 276.
lunata, 276.
Aspidobos
curta, 433.
Assiminea
carinata, 354.
(Optediceros) *cornea*, 354.
Astrarchia
stephaniæ, 451.
Astropecten
polyacanthus, 7.
Astur
approximans, 79.
trivirgatus, 225.
Atherura
fasciculata, 76, 77.
macrura, 76, 236.
Attacus
atlas, 86, 87.
cynthia, 86.
hesperus, 86, 87.
pernyi, 86.
ricini, 86.
roylei, 86.
Auchenoglanis
biscutatus, 210.
Auchmis
sikkimensis, 494.
Aulacochilus
moluccanus, 618.
Aurelia
aurita, 583, 584, 585.
flavidula, 584.
Ausonia
curieri, 322.
Autophila
dilucida, 541.
Axylia
putris, 486.
Azazia
unduligera, 553.
ussuriensis, 553.

Balistes
erythrodon, 242.
Barangia
nepalensis, 193, 194, 195.
sumatrana, 193, 195.
Barbatula
affinis, 357.
leucotis, 357.
Barbus
jacksoni, 72.
neumayeri, 70.
pagenstecheri, 70.
Bathyergus
maritimus, 260, 262.
Batrachostomus
cornutus, 226.
Baza
leucopias, 226.
Bellone
cristata, 395.
Belone
appendiculata, 241.
melanostigma, 241.
Belostieta
extensa, 503.
Bembidium
(Peryphus) *bracculatum*, 212.
(—) *dardum*, 212.
Berrhæa
japonica, 507, 571.
olivacea, 507.
Bertula
raptatalis, 566.
Beryx
decadactyla, 323.
Bibos
gaurus, 447.
Bipalium
kewense, 5, 6, 586.
Bireta
longivitta, 407.
nana, 407.
xanthophila, 407.
Birgus
latro, 393.
Bithiasa
notigera, 555.
Blacicus
brunneicapillus, 326, 327.
Bleptina
ægrota, 565.
dimissalis, 565.
incultalis, 564, 571.
lignea, 565.
metisalis, 565.
morosa, 565.
petrina, 565.
spacoalis, 565.
Bocana
incongruens, 566.
metisalis, 565.
niphona, 566.
tristis, 566.
Bolina
maximowiczi, 547.
Bombyx
calunæ, 86.
capucina, 529.
fragariæ, 514.
libatrix, 505.
rhadama, 86.
spreta, 510.
thalictri, 529.
Bomolochra
crassulis, 556.
fontis, 556.
Bonellia
viridis, 54.

Bordeta
quadriplagiata, 296.
Bothriocephalus
macrobothrium, 323.
platycephalus, 323, 325.
tetrapterus, 323, 325.
Bracca
bajularia, 294, 297.
Brachysphenus
batesi, 617, 620.
bistrifoliatus, 616, 620.
bizonatus, 617.
cordiger, 615.
distinctus, 617.
egensis, 615, 620.
epipleuralis, 617.
glyptoderus, 618.
incas, 617, 620.
musicalis, 617.
mutabilis, 618.
perversus, 618.
ucayalensis, 615, 620.
Brachyxanthia
peculiaris, 517.
Bradyornis
ater, 363.
Bradypterus
barratti, 364.
Brotula
ensiformis, 241.
maculata, 241.
multibarbata, 241.
Bryophila
algæ, 479.
guenei, 526.
Bubo
lacteus, 356.
Bubulcus
coromandus, 225.
Buceros
albirostris, 187.
atratus, 591.
bicornis, 587, 588, 590.
coronatus, 587.
lunatus, 590.
plicatus, 587.
rhinoceros, 587, 588, 589, 590.
ruficollis, 178, 181.
subcylindricus, 587.
Buchanga
leucophæa, 226.
Bucklandium
diluvii, 207, 208, 210.
Bucorvus
abyssinicus, 587, 588, 589, 590, 592, 593.
Bufo
calamita, 29.
Bulimus
blainvilleanus, 582.
Bulimus
fulminans, 582.
—, var. *linteræ*, 582.
gibbosa, 138, 139.
loveni, 582.
salteri, 578, 582.
superstriatus, 578, 582.
taylorianus, 578.
variabilis, 138.
venustus, 580.
(Bulimus) *gomezi*, 580, 582.
(—) *hanningtoni*, 580, 582.
(Mesembrinus) *bowkeri*, 581, 582.
Bürgeria
maculata, 31.
Butastur
indicus, 225.
Buteo
pennsylvanicus, 326, 395.
Butorides
javanica, 225.
virescens, 326.
Buzurra
multipunctaria, 426.
varianaria, 425.
Bycanistes
subcylindricus, 590.

Cacatua
hæmaturopygia, 225.
Cacomantis
merulinus, 225.
Cacoscelis
semifulva, 274.
Cadyanda
lugens, 295.
Calamoherpe
ochotensis, 621.
palustris, 621.
Calicula
exempta, 543.
squamiplena, 543.
Calligrapha
percheroni, 207.
Callimorpha
dominula, 86.
Calliodes
rectifasciata, 545.
Callopistes
maculatus, 465.
Callopistria
æthiops, 536.
duplicans, 536.
exotica, 536.
obscura, 536.
Callopistria
pteridis, 536.
purpureofasciata, 536.
repleta, 537.
rivularis, 537.
Callorhynchus
antarcticus, 323.
Calobochyla
salicalis, 555.
Calocampa
exoleta, 539.
formosa, 539.
fumosa, 539.
Calœnas
nicobarica, 225.
Calornis
panayensis, 225.
Calospila
leucomela, 294, 295, 296, 297.
picaria, 295.
posthumaria, 294, 295.
Calpe
capucina, 529.
excavata, 529.
lata, 529.
libatrix, 505.
Calymnia
achatina, 515.
affinis, 515.
camptostigma, 515.
pryeri, 516, 571.
pyralina, 515.
restituta, 516.
trapezina, 515, 516.
Calyptra
libatrix, 505.
Campophaga
nigra, 359.
Campothera
nubica, 356.
Cania
bilinea, 409.
pulligenis, 408, 432.
Canis
jubatus, 220.
Capnodes
cinerea, 555.
cremata, 554.
curvipalpis, 555.
gensanalis, 555.
Capra
sibirica, 135.
sinaitica, 246.
Caprimulgus
europæus, 178, 181.
macrurus, 226.
manillensis, 225.
Carabus
boysi, 211.
dardiellus, 211.

Carabus
dardiellus, var. *granulisparsus*, 211.
ichangensis, 217.
kashmirensis, 211.
longipennis, 217.
protenes, 217.
smaragdinus, 217.
tientei, 217.
—, var. *minor*, 217.
wallichi, 211.
(Coptolabrus) *longipennis*, 217.
(—) *principalis*, 216.
(—) *pustulifer*, 217.
(Inaibius) *barysomus*, 210.
Caradrina
albosignata, 493.
—, var. *cæca*, 493.
exigua, 493.
lenta, 493.
morpheus, 493.
Caranx
affinis, 240.
ciliaris, 240.
jayakari, 245, 246.
leptolepis, 240.
malabaricus, 240.
nigrescens, 245.
trachurus, 240.
Carcharias
acutidens, 242.
brevipinna, 243.
gangeticus, 243.
hemiodon, 243.
melanopterus, 243.
menisorrah, 243.
murrayi, 243.
Cariama
cristata, 25, 594, 595.
Carpophaga
ænea, 225.
bicolor, 225.
versicolor, 586.
Catarractes
chrysocome, 84.
Cathartes
atratus, 313.
aura, 82.
Catoblepas
gnu, 2, 3, 4, 220.
Catocala
actæa, 549.
amata, 547.
bella, 550.
connexa, 552.
dissimilis, 549.
dula, 549.
duplicata, 552.
electa, 550.
Catocala
ella, 551.
esther, 551.
hymenea, 551.
intacta, 548, 571.
jonasii, 550.
lara, 548.
mirifica, 550.
modesta, 548.
nivea, 548.
nubila, 552.
nupta, 549.
—, var. *obscurata*, 549.
omphale, 551.
parunympha, 552.
præpax, 552.
puella, 551, 571.
sancta, 549.
separans, 551, 571.
volcanica, 550.
xarippe, 552.
zalmunna, 550.
Celæna
serva, 492.
Celeopsyche
nitens, 570.
Celerena
cincta, 295.
extenuata, 295.
leucomela, 295.
sobria, 295.
Centrococcyx
eurycercus, 226.
javanensis, 226.
Cerastis
albipunctata, 514, 571.
evelina, 514.
fragariæ, 514.
lævis, 485.
serotina, 514.
vaccinii, 514.
Ceratogymna
elata, 589, 590, 591.
Ceratorhinus
sumatrensis, 257, 258.
Cercolabes
novæ-hispaniæ, 260.
Certhiola
dominicana, 326.
martinicana, 395.
Cervulus
crinifrons, 85.
fæa, 85.
Ceryle
alcyon, 175, 181, 182.
maxima, 357.
Cettia
diphone, 586.
Ceyx
rufidorsa, 226.
Chærocampa
elpenor, 87.
Chærops
ammopterus, 151, 158.
Chætodon
modestus, 236, 239.
Chætura
dominica, 327.
gigantea, 224.
Chalcides
viridanus, 143.
Chalcopelia
afra, 369.
chalcospilos, 369.
Chalcophaps
indica, 225.
Chalcostethia
insignis, 226.
Chalcothea
affinis, 389.
planiuscula, 389.
pomacea, 389.
virens, 387.
(Plectrone) *azripes*, 387.
(—) *spathulifera*, 388.
(—) *viridipes*, 388.
Chamæpelia
passerina, 326, 395.
Charadrius
fulvus, 225.
Charicles
umbra, 520.
Chasmina
atrata, 522.
Chasmocephalon, gen. nov., 45.
neglectum, 45, 46.
Chauna
chavaria, 586.
Chelidon
urbica, 182.
Chelone
crassicostata, 60, 61, 63, 65, 66.
longiceps, 62.
planimentum, 61, 62, 63.
trigoniceps, 62.
viridis, 188.
Chersotis
quadrisigna, 498.
Chibia
palawanensis, 225.
Chilomycterus
echinatus, 236, 242.
orbicularis, 242.
Chimarrogale
himalayica, 229.

Chironectes
minimus, 197.
Chiropodomys
gliroides, 235.
Chlænius
anchomenoides, 212.
cæruleus, 213.
noguchii, 213.
Chlorophoneus
sulphureipectus, 362.
Chloropsis
palawanensis, 226.
Chorismodactylus
multibarbis, 239.
Chromis
mossambicus, 70.
niloticus, 70.
Chrysococcyx
xanthorhynchus, 226.
Chrysocolaptes
erythrocephalus, 225.
Chrysocoma
pachyrhynchus, 83.
saltator, 84.
Chrysomitridops, gen. nov., 445.
cæruleirostris, 445.
Chrysomitris
citrinelloides, 367.
Chrysophanus
pavana, 397, 398.
phlæas, 397.
phœnicurus, 397.
susanus, 397.
Chrysorithrum
amatum, 547.
fuscum, 547.
maximowiczi, 547.
rufescens, 547.
sericeum, 547.
Chrysotis
augusta, 326, 327.
bougueti, 326, 327.
guildingi, 327.
pretrii, 394.
versicolor, 327, 395.
Chunga
burmeisteri, 594.
Cicendela
borneana, 383.
crespignyi, 383.
Cichlherminia
sanctæ-luciæ, 395.
Cidaria
cervinaria, 429.
multifaria, 429, 432.
Cidariplura
gladiata, 564.
Cinclocerthia
macrorhyncha, 395.
ruficauda, 326.
Cinnyris
affinis, 365.
aurora, 225.
gutturalis, 365.
hunteri, 356, 365.
kalckreuthi, 366.
kirki, 366.
mediocris, 365.
microrhynchus, 365.
operata, 225.
Circus
maurus, 78, 79.
spilonotus, 225.
Cirrhitichthys
maculatus, 239.
Cirroedia
edentata, 505.
variolosa, 505.
Cisticola
cisticola, 224.
hunteri, 356, 364.
subrufucapilla, 364.
Citrea
cerago, 517.
silago, 517.
Cittocincla
nigra, 226.
Clarias
mossambicus, 70.
Clerota
brama, 388.
Cloantha
intermedia, 494.
perspicillaris, 494.
polyodon, 494.
Clostera
anachoreta, 87.
Coccyzus
americanus, 187.
minor, 326, 395.
Cocytodes
immodesta, 548.
modesta, 548.
Cœlomera
cayanensis, 286.
Colius
leucotis, 358.
Collocalia
fuciphaga, 224.
troglodytes, 225.
Collyris
aureofusca, 216.
formosaria, 216.
Colotois
kumetaria, 424, 425.
Colpodes
eulabes, 215.
fryi, 384.
melittus, 215.
Columba
corensis, 395.
Columba
guineensis, 369.
Contopus
latirostris, 395.
Coptolabrus
cœlestis, 217.
elysii, 217.
Coracias
caudata, 358.
Corax
albicollis, 368.
Corone
philippina, 225.
pusilla, 226.
Corvultur
albicollis, 368.
Coryphocera
borneensis, 386.
Corythaix
hartlaubi, 358.
livingstoni, 220.
porphyreolophus, 358.
Cosmia
achatina, 515.
affinis, 515.
curvata, 516.
distincta, 515.
pyralina, 515.
restituta, 516.
trapezina, 516.
Cosmophila
indica, 505.
xanthindyma, 505.
Cossa
basigera, 402.
ruma, 402.
Cossypha
caffra, 363.
Cottus
lilljeborgii, 27.
Crambus
crassalis, 556.
Craspedosis
ernestina, 294, 295.
extenuata, 294, 295, 297.
Craspedotropis
barbatus, 339.
bellulus, 339.
confluens, 339.
metcalfi, 339.
Crax
globicera, 163.
Crepidodera
castanea, 274.
pleuralis, 274.
Cricula
trifenestrata, 86.
Criniger
frater, 226.
palawanensis, 226.

Crithagra
striolatus, 367.
Crocallis
angularia, 423.
bilinearia, 423.
Crocidura
fuliginosa, 230.
(Crocidura), sp. inc., 230.
Crotophaga
ani, 395.
Cryptocephalus
anceps, 266.
atomaroides, 266.
auratus, 266.
decorus, 266.
obfuscatus, 266.
Cryptolopha
montis, 226.
umbrovirens, 360.
Cryptoprocta
ferox, 261.
Ctenodrilus
monostylos, 55.
pardalis, 55.
parvulus, 55.
Ctenomys
minutus, 199.
Cucullia
asteris, 538.
fraterna, 538.
perforata, 538.
Cuculus
canorus, 175, 181, 187, 225.
sonnerati, 226.
Cucumaria
semperi, 7.
Culicicapa
ceylonensis, 224.
panayensis, 225.
Cursorius
cinctus, 371.
Cyanea
amaskala, 585.
Cybium
lineolatum, 240.
Cyclophorus
amboinensis, 344.
hellulus, 339.
borneensis, 334, 335, 336.
cochranei, 334.
—, var. *ochraceus*, 335.
confluens, 439.
metcalfei, 339.
niahensis, 334, 355.
phlegethon, 335.
talboti, 335.
tenebricosus, 334.
triliratus, 345.
Cyclostoma
anostoma, 352.
bicolor, 336.
birostre, 341.
borneensis, 334.
hanningtoni, 581, 582.
insulare, 581.
leferi, 352.
pertusum, 341.
pterocycloides, 341.
quadrifilosum, 345.
rostellatum, 341.
sectilabrum, 352.
spiniferum, 341.
spiracellum, 346.
subinvolvulus, 334.
taylorianum, 341.
tenebricosus, 334.
tenuilabiatus, 339.
triliratum, 345.
undatum, 337.
(Leptopoma) *barbatum*, 339.
(—) *sericatum*, 336.
(—) *signatum*, 336.
(Opisthoporus) *eurymphalus*, 341.
(Pterocyclos) *charbonnieri*, 341.
Cyclotus
amboinensis, 344.
angulatus, 345.
boxalli, 343, 355.
latistrigus, 341.
linitus, 345, 355.
ptychoraphe, 345.
triliratus, 345.
trusanensis, 344, 355.
Cymatophora
retusa, 576.
Cynodraco
major, 576.
Cynopterus
caudatus, 229.
lucasi, 229.
Cynthia
asela, 396, 397.
erota, 396, 397.
saloma, 396.
Cypselus
affinis, 359.
apus, 178, 182.
caffer, 359.
horus, 359.
melba, 359.
sharpii, 359.

Dactylopterus
orientalis, 240.
Dadica
lineosa, 493.
palpalis, 493.
Damalis
hunteri, 58, 372, 373, 374, 375.
senegalensis, 58, 372.
Danaga
concisalis, 420.
pullatalis, 420.
Dandaca
megei, 542.
senex, 542.
Dasycampa
ardescens, 514.
evelina, 514.
fornax, 517.
rubiginea, 517.
Deilephila
euphorbiæ, 87.
galii, 87.
vespertilio, 87.
Deinodrilus
benhami, 379.
Dendricon
rastratum, 250, 251.
Dendrocolaptes
perroti, 34.
Dendrœca
delicata, 395.
melanoptera, 326.
plumbea, 326.
Dendrophila
frontalis, 226.
Dero
digitata, 440.
obtusa, 440.
perrieri, 440, 441.
Desmogramma
decorata, 268.
Deva
splendida, 534.
Diabrotica
ægrota, 90.
æneiventris, 95.
albido-vittata, 95.
albocincta, 93.
albomarginata, 92.
albopicta, 93.
alcyone, 94.
ambitiosa, 282.
atomaria, 284.
atromaculata, 90.
biannularis, 282.
bimaculata, 284.
bipartita, 95.
boliviana, 283.
clarkella, 89.
clypeata, 285.

Diabrotica
cognata, 93.
confraterna, 90.
contigua, 88.
delineata, 282.
dilatata, 284.
discrepans, 94.
erythroptera, 95.
estebanensis, 281.
evanescens, 90.
extensa, 88.
fulvofasciata, 281.
gemmingeri, 281.
glaucina, 89.
haroldi, 282.
hemixantha, 91.
inæqualis, 282.
interrupta-lineata, 91.
limbatipennis, 93.
limitata, 91.
melancholica, 92.
melanopyga, 88.
mutabilis, 281.
nigrodorsata, 283.
nigrostriata, 284.
nitidicollis, 89.
notaticollis, 91.
obscuro-maculata, 282.
obtiva, 284.
perspicua, 94.
piccicornis, 89.
porracea, 281.
puncticollis, 282.
robusta, 283, 284.
scutellata, 89.
separata, 285.
serraticornis, 283.
simoni, 280, 281.
simulans, 93.
simplicipennis, 284.
spiloptera, 92.
spilota, 284.
stali, 94.
suaveola, 94.
tuberculata, 91.
12-*signata*, 90.
unifasciata, 92.
vagrans, 90.
varicornis, 282.
virginella, 281.
viridans, 89.
zonula, 92.
Diagramma
griseum, 245.
jayakari, 245.
Dianthœcia
compta, 517, 518.
cucubali, 518.
geometroides, 543.
Diastema
virgo, 534.
Dicerobatis
eregoodoo, 244.
Dicholophus
cristatus, 594.
Dichonia
intermissa, 507.
protea, 506.
Dichromia
amica, 556.
claripennis, 556.
Didymozoon
serrani, 322, 323, 325.
Dinopelma, nov. gen., 385.
plantigradum, 385.
Dinumma
bipunctata, 541.
Diodon
hystrix, 242.
Diomedea
brachyura, 324.
exulans, 324.
Diphtera
gemmifera, 480.
lætevirens, 480.
orion, 479.
Diplommatina
adversa, 348, 355.
albata, 113, 117.
aurea, 113, 117.
beccarii, 348.
busanensis, 348, 355.
concinna, 348.
crassilabris, 113, 117.
gibboni, 114, 117.
isseli, 348, 355.
lutea, 112, 117.
niahensis, 349, 355.
patula, 114, 117.
platycheilus, 112, 117.
rubella, 113, 117.
rubicunda, 348.
rubra, 349, 355.
spinosa, 349.
strigata, var. *kororensis*, 115, 117.
Dipterygia
japonica, 489, 571.
pinastri, 488.
scabriuscula, 489.
Dirphia
tarquinia, 86.
Disonycha
austriaca, 272.
eximia, 272.
glabrata, 272.
lævipennis, 272.
steinheili, 272.
trifasciata, 271.
Distomum
gigas, 322, 325.
halosauri, 322, 325.
microcephalum, 322.
microporum, 322, 325.
veliporum, 321, 322.
Doryodes
electaria, 554.
Doryphora
blanda, 267.
fasciata, 267.
maculata, 267.
punctatissima, 267.
pura, 267.
simoni, 267.
Drepanorhynchus
reichenowi, 365.
Dryococcyx
harringtoni, 226.
Dryoscopus
æthiopicus, 361.
cubla, 361.
funebris, 361.

Eacles
imperialis, 87.
Echeneis
clypeata, 236, 240.
lophioides, 240.
naucrates, 240.
Echinodiscus
auritus, 7.
Echinorhinus
spinosus, 236, 243.
Edessena
hamada, 564.
Egnasia
erebina, 569.
fallax, 569.
opalina, 569.
polybapta, 568.
porphyrea, 569.
pulcherrima, 569.
pusilla, 569.
simplex, 569.
trimantesalis, 567.
vasava, 568.
Elainea
martinica, 326, 395.
Eliochrœa
senex, 542.
Elydna
diurna, 412, 432.
transversa, 413.
Emberiza
cioides, 6.
ciopsis, 6.
flaviventris, 367.
Emys
europæa, 603.

Enchesia
unxia, 518.
Engis
annulata, 614.
Ennomos
angularia, 87.
Epia
claripennis, 518.
Epifidonia
absona, 427.
signata, 428.
Epilecta
pulcherrima, 501.
semiherbida, 502.
Epimachus
maclearyanæ, 451.
minor, 358.
Epinephelus
brunneus, 244.
Episcapha
annulata, 614, 620.
oculata, 614.
Episparis
exprimens, 416.
sora, 415.
Epitrix
flavcola, 273.
flavicola, 273.
fulvicornis, 272.
hirtula, 273.
opacicollis, 273.
venezuelensis, 273.
Epizeuxia
maculifera, 566.
Erastria
atrata, 527.
africana, 525.
brunnea, 527, 571.
candidula, 525.
costimacula, 525.
fasciata, 526, 527.
fentoni, 526.
flavicollis, 525, 571.
flavipuncta, 424, 571.
fuscula, 526.
nemorum, 525.
olivacea, 526, 527, 571.
rosacea, 527, 571.
securifera, 528.
senex, 525.
sidemiata, 527.
squalida, 527, 571.
stygia, 526.
sulphurea, 528.
unca, 522.
Ercheia
umbrosa, 548.
Eretmophorus
kleinenbergi, 328, 330, 332.
Eriopus
exotica, 536.
pteridis, 536.
Erygia
apicalis, 543.
Erythra
phœnicura, 225.
Erythrichthys
schlegeli, 236, 238.
Erythrospiza
githaginea, 26.
Estrelda
quartinia, 367.
Euchloë
cardamines, 86.
Euclidia
consors, 554.
glyphica, 554.
Eudocimus
albus, 26.
longirostris, 26.
Eudromias
veredu, 225.
versicolor, 86.
Eudynamis
malayana, 226.
mindanensis, 225.
Eudyptes
chrysocome, 82, 84.
filholi, 82, 84.
nigriventris, 84.
nigrivestis, 84.
pachyrhynchus, 82, 83.
saltator, 82, 84.
sclateri, 82, 83, 84.
Eulabes
palawanensis, 226.
Eulampis
holosericeus, 326, 395.
jugularis, 326, 395.
Euphenges
subcostatus, 279.
Euphonia
flavifrons, 395.
Eupidotis
maculipennis, 371.
Eupithecia
infestata, 430.
minuta, 430.
Euplexia
albovittata, 504.
japonica, 504, 571.
luciparo, 504, 505.
Euplynes
auro-cinctus, 384.
Eupsilia
strigifera, 511.
tripunctata, 511.
Eurhipia
guyra, 536.
Eurocephalus
anguitimens, 361.
rueppelli, 361.
Eurois
auriplena, 508.
herbida, 507.
nebulosa, 508.
occulta, 508.
prasina, 507.
virens, 507.
Eurystomus
orientalis, 224.
Euschema
minervaria, 294.
proba, 294.
Eusemia
accurata, 401.
basalis, 401.
peshwa, 401.
Eustegnia
pyralina, 515.
Eusyntheta, nov. gen., 392.
brevicornis, 393.
Excalfactoria
chinensis, 225.

Falco
æsalon, 78.
caribbæarum, 395.
communis, 225.
severus, 225.
subbuteo, 78.
Felis
minuta, 223.
servalina, 220.
Fibularia
volva, 7.
Fierasfer
acus, 27.
Fiscus
caudatus, 362.
Francolinus
altumi, 370.
coqui, 370.
granti, 370.
hildebrandti, 370.
infuscatus, 370.
ochreogaster, 370.
schuetti, 370.
(Pternistes) *leucoparæus*, 370.
(Scleroptera) *hildebrandti*, 370.
(—) *schuetti*, 370.
Fregata
minor, 225.
Fringilla
kittlitzi, 586.

Gabala
argentata, 561.
Gadus
esmarkii, 27.
Galathea
strigosa, 394.
Galeocerdo
tigrinus, 243.
Galerucella
alternata, 291.
fuscomaculata, 291.
obscurofasciata, 291.
ornata, 290.
Gallinago
megala, 225.
Gallirex
chlorochlamys, 358.
Gallus
bankiva, 225.
Ganoris
novangliæ, 296.
rapæ, 296.
Gastornis
klaasseni, 220.
Gauresthes, nov. gen., 392.
rufipes, 392.
Gavæus
gaurus, 448.
Gazella
granti, 59.
thomsoni, 59.
walleri, 376.
Gecinus
viridis, 166, 172.
Gecko
monarchus, 143.
stentor, 143.
Geococcyx
affinis, 181, 187.
Georissa
hosei, 353, 355.
kungerfordi, 354, 355.
niahensis, 353, 355.
williamsi, 353, 355.
Georychus
capensis, 246, 316, 449.
Geotrygon
montana, 395.
Gerbatha
angusta, 478.
granitalis, 479.
pseudodyops, 490.
subfasciata, 491.
ypsilon, 479.
Gerrhosaurus
flavigularis, 465, 604.
Gisira
hercules, 543.
signata, 560.
Glareola
orientalis, 225.
Glottula
sordida, 490.
squalida, 490, 571.
Glyptophysa
petiti, 142.
Glyptothea, nov. gen., 390.
whiteheadi, 390.
Gonatus
fabricii, 117.
Gongylus
melanogastricus, 143.
Goniocephalus
sophiæ, 465.
Goniodiscus
granuliferus, 6.
Gonitis
albitibia, 506.
basalis, 505.
combinans, 506.
commoda, 506.
distincta, 506, 571.
fractifera, 505.
involuta, 505.
pryeri, 506, 571.
Gonoptera
libatrix, 505.
Gorgonia
vermiculata, 49.
Gorsachius
melanolophus, 225.
Gortyna
acuminata, 519.
edentata, 485, 571.
emarginata, 485.
flavago, 485.
nictitans, var. *lucens*, 484.
Graphiphora
augur, 495.
brunnea, 497.
caliginea, 500.
canescens, 497.
c-nigrum, 496.
contaminata, 542.
crassa, 500.
dahlii, 497.
deparca, 498.
descripta, 497.
ditrapezium, 496.
exusta, 496, 497.
fasciata, 412.
festiva, 498.
illobata, 498.
lepida, 495.
lubentia, 496.
pacifica, 498.
rubicilia, 497.
subdolens, 497.
Graphiphora
triangulum, 496.
valida, 500, 501.
viaria, 412.
Gryllotalpa
vulgaris, 219.
Gubaria
subalbataria, 428.
xanthonora, 429.
Gymnodactylus
horridus, 143, 145.
Gypaetus
barbatus, 80.
Gypohierax
angolensis, 81, 82.
Gyrocotyle
rugosa, 323.

Habrostola
asclepiades, 534.
transfixa, 534.
triplasia, 534.
urentis, 535.
Hadena
aliena, 487.
atriplicis, 510.
auriplena, 508.
caliginosa, 488.
funerea, 487, 488.
gemina, 489.
gnoma, 510.
jankowskii, 508.
kosakka, 508.
littoralis, 510.
lucia, 508.
parietum, 491.
protea, 506.
satura, 509.
seladonia, 507.
stolida, 509, 571.
tokiensis, 508.
unica, 509, 571.
(Apamea) *askoldis*, 490.
Halcyon
chelicutensis, 357.
chloris, 225.
coromanda, 226.
pileata, 226.
Haliaetus
albicilla, 79.
leucogaster, 225.
Halosaurus
macrochir, 322.
Haltica
amethystina, 271.
plicatula, 271.
(Graptodera) *transversicollis*, 271.
Hapalia
præcox, 499.

Hapaloderma
vittatum, 356, 359.
Hapalopteron
familiare, 586.
Haplocerus
montanus, 59.
Harmatelia
bifidalis, 568.
Harpalus
idiotus, 213.
kashmirensis, 213.
Hebomoia
glaucippe, 296.
Helicina
borneensis, 352.
citrina, 353.
crossei, 352.
martensi, 352, 353.
usukanensis, 352, 355.
Heliophobus
dissectus, 486.
Heliothis
adaucta, 520.
armigera, 519.
camptosigma, 515.
dipsaceus, 520.
furvens, 520.
marginata, 520.
succinea, 519.
scutosus, 520.
Helix
constrictor, 116.
lactiflora, 578.
(Corasia) *woodfordi*, 578, 582.
(Endodonta) *fusco-zonata*, 116, 117.
(—) *kororensis*, 116, 117.
(Geotrochus) *horderi*, 577, 582.
Helotropha
leucostigma, 485.
Hemerodromus
cinctus, 371.
Hemichelidon
sibirica, 224.
Heptadonta
tricondyloides, 383.
Hermæophaga
haroldi, 270.
nitidicollis, 270.
nitidissima, 270.
simoni, 269.
subcostata, 269.
Herminia
albomaculalis, 563.
arenosa, 562.
barbalis, 561.
derivalis, 562.
Herminia
dolosa, 563.
fascialis, 563.
fentoni, 564.
fumosa, 562.
grisealis, 561.
grisalda, 563.
helva, 563.
innocens, 564.
ningpoalis, 563.
pryeri, 563.
rectalis, 564.
sicca, 564.
stramentacealis, 562.
tarsicrinalis, 562.
tarsipennalis, 562.
trilinealis, 561.
Hermonassa
cecilia, 498.
Herodias
intermedia, 225.
Herpestes
albicaudatus, 622, 623.
brachyurus, 223.
ichneumon, 622.
galera robustus, 622.
grandis, 622, 623, 624.
Heterocephalus
phillipsi, 247.
Hierococcyx
strenuus, 225.
Himatione
chloris, 446, 447.
montana, 446.
parva, 446.
stejnegeri, 446.
Hirundo
gutturalis, 224.
javanica, 224.
Homalisus
sp. nov., 111.
Homophœta
æquinoctialis, 275.
variabilis, 275.
Homopus
femoralis, 85.
signatus, 85.
Hoplopterus
speciosus, 372.
Hoporina
croceago, 517.
sericea, 517.
Hormisa
calamina, 560.
cramboides, 560.
morosa, 560.
Hungerfordia
pelewensis, 115, 117.
Huphina
nama, var. *andamana*, 398.
Hyblæa
fortissima, 518.
puera, 518.
saga, 518.
Hyboma
divisa, 478.
strigosa, 478.
Hydræcia
immanis, 484.
leucostigma, 485.
nictitans, 484.
petasitis, 484.
Hydrelia
unca, 522.
Hydrillodes
lentalis, 565.
Hydrocampa
simplalis, 421.
Hydocena
cornea, 354.
(Omphalotropsis, *glabrata*, 354.
(—) *radiata*, 354.
Hydrogale
maculicollis, 196.
Hydromys
chrysogaster, 248, 250.
Hyla
leucomystax, 29.
maculata, 30.
quadrilineata, 29.
sexvirgata, 29.
Hylexetastes
gen. nov., 34.
Hylomys
suillus, 229.
— *dorsalis*, 229.
Hylorana
longipes, 27, 29.
Hyloterpe
whiteheadi, 226.
Hymophyla
adusta, 273.
variabilis, 273.
Hypena
abductalis, 559.
albopunctalis, 557, 571.
belinda, 557.
columbaris, 559.
corealis, 560.
ella, 556.
fontis, 556.
gilla, 556.
herbigrada, 416.
incurvata, 559.
indicatalis, 556.
kengkalis, 558, 559.

Hypena
longipennis, 416, 417.
mandatalis, 558.
minna, 559.
obaceralis, 416.
obesalis, 558.
proboscidalis, 559.
radicalis, 416.
rhombalis, 556.
rivuligera, 557.
rostralis, 558.
rusticalis, 559.
satsumalis, 557.
similalis, 558, 559, 571.
squalida, 556.
stigiana, 557, 558.
suboyanea, 559.
subviolacea, 559.
tatorhina, 559.
tripunctalis, 558.
virgens, 559.
Hyperoodon
rostratus, 117.
Hyphantornis
aureoflavus, 367.
Hypochera
io, 86.
Hypolampsis
fragilis, 278.
Hypopyra
dulcina, 546.
vespertilio, 545, 546.
Hypothymis
occipitalis, 224.
Hypsipetes
squamiceps, 586.
Hypsirhynchus
hepaticus, 330, 332.
Hyracodontotherium
filholi, 67, 68, 69.
primævum, 67, 68.
Hystrix
fasciculata, 236.
pumila, 223.

Icterus
laudabilis, 395.
Idiops
colletti, 35, 37, 38, 46.
crassus, 38.
syriacus, 38.
Iguana
tuberculata, 465.
Ilattia
apicalis, 493.
cephusalis, 492.
stellata, 493.
Ilyrgis
echephurealis, 566.
Indicator
major, 356.
Inguridia
abrostolina, 535.
Iole
striaticeps, 226.
Ipimorpha
retusa, 516.
Irena
tweeddalii, 226.
Irrisor
cyanomelas, 358.
minor, 358.
Ixias
nola, 399.

Jerdonia
borneensis, 345, 355.
trochlea, 346.
Julis
lunaris, 240.
Julodis
finchi, 219.

Kerivoula
hardwickii, 223.
Ketupa
ceylonensis, 165.
Kinibalua, nov. gen., 391.
megalops, 391.

Lacera
procellosa, 547.
Lacerta
muralis, 465.
viridis, 465, 471, 612.
vivipara, 460.
Lactica
bisfasciata, 271.
bogotana, 271.
citrina, 271.
dichroa, 271.
scutellaris, 271.
Lactina
agilis, 271.
Lagocheilus
dido, 338, 355.
keppeli, 338, 355.
mundyanus, 338, 355.
Lagoptera
elegans, 548.
multicolor, 548.
Lagopus
scoticus, 325.
Lagyra
picaria, 295.
Lalage
terat, 224.
Lamna
glauca, 243.
spallanzanii, 243.
Lamprocolius
sycobius, 368.
Lamprosticta
bella, 504.
venusta, 504, 571.
Langanum
depressum, 7.
Laniarius
sulfureipectus, 362.
Lanius
caudatus, 362.
luzoniensis, 225.
Laphygma
exigua, 493.
Larus
canus, 178.
gelastes, 316.
melanocephalus, 316.
Lebia
caligata, 218.
callitrema, 219.
prattiana, 218.
xanthopæa, 219.
xanthophana, 218.
Leiosaurus
marmoratus, 144.
multipunctatus, 144.
scapulatus, 144.
Lema
buckleyi, 265.
calceata, 265.
dorsalis, 266.
ducalis, 265.
dubia, 265.
equestris, 265.
nupta, 265.
orbignyi, 266.
patruelis, 264.
sagittifera, 266.
simoni, 265.
Leocyma
albonitens, 522.
atrata, 522.
nervosa, 522.
nigrilinea, 522, 571.
Lepidosiren
paradoxa, 150.
Leptina
grata, 535.
Leptopoma
barbatum, 339.
bicolor, 336.
bourguignati, 337.
duplicatum, 337.
lowi, 336.
massena, 337.
sericatum, 336, 337.
signatum, 336.
subconicum, 337.
tenebricosum, 334.
undatum, 337.

Leptopoma
wallacei, 337.
whiteheadi, 337.
woodfordi, 581, 582.
Lestes
viridula, 303.
wallacei, 298, 302.
Leucania
abdominalis, 483.
caricis, 482.
conigera, 483.
decisissima, 482.
extranea, 482.
flavostigma, 482.
—, var. *inornata*, 482, 571.
impura, 483.
inanis, 481.
innocens, 483.
loreyi, 482.
nigrilinea, 482, 571.
radiata, 483.
rufistrigosa, 482.
salebrosa, 482.
singularis, 482.
turca, 481.
zeæ, 483.
Leuciscus
rutilus, 50.
Leucopeza
semperi, 395.
Lichia
glauca, 50.
vadigo, 50.
Limenitis
populi, 86.
sibylla, 86.
Limicola
platyrhyncha, 225.
Limnæa
physopsis, 137.
stagnalis, 139, 140.
Limnodrilus
sp. inc., 381.
Limnophyes
gen. nov., 34.
Limnornis
curvirostris, 34.
Linura
fischeri, 367.
Lissotis
maculipennis, 371.
Lithophane
saga, 538.
Lithopsyche
antiqua, 294, 297.
Lochmæa
tropica, 287.
Locustella
fasciolata, 620.
pleskei, 620.
Loxigilla
noctis, 326, 395.
— *sclateri*, 395.
Loxops
coccinea, 446.
flammea, 445.
Lumbricus
annularis, 377.
campestris, 377, 378.
levis, 377, 378.
uliginosus, 377, 378.
Luperodes
inornatus, 289.
Luperus
marginatus, 289.
Lutra
sp., 223.
angustifrons, 195.
aterrima, 199.
aurobrunnea, 192, 193, 194, 195.
barang, 191, 192, 193, 194, 195, 200.
brachydactyla, 198.
brasiliensis, 197, 198, 200.
californica, 198.
canadensis, 197, 199, 200.
capensis, 191, 196, 200.
chilensis, 198.
chinensis, 192, 195.
cinerea, 193, 195, 200.
ellioti, 192, 195.
enhydris, 199.
enudris, 197.
felina, 191, 197, 198.
grayi, 196.
indica, 192, 195.
indigitata, 195.
insularis, 199.
inunguis, 196.
lalandii, 196.
latifrons, 199.
lenoiri, 196.
leptonyx, 192, 193, 195.
lupina, 197.
macrodus, 192, 194, 195.
maculicollis, 191, 196, 200.
mantiola, 192, 195.
nair, 192, 195.
nepalensis, 192.
nudipes, 195.
palæindica, 193.
paraguensis, 197.
paranensis, 191, 198, 199, 200.
perspicillata, 195.
peruviensis, 198.
Lutra
platensis, 197, 199, 200.
poensis, 196.
roensis, 195.
simung, 192, 195.
solitaria, 199.
sumatrana, 191, 192, 193, 194, 195, 200.
swinhoei, 195.
tarayensis, 195.
vulgaris, 192, 193, 194, 195, 197, 200.
Lutronectes
whiteleyi, 195.
Lycocerus
caliginosus, 110, 111.
decipiens, 109.
lateritius, 109.
militaris, 110, 111.
serricornis, 109, 110, 111.
Lymantria
grandis, 406, 407.
viola, 406.
Lytoloma
crassicostatum, 63, 66.
planimentum, 66.

Macacus
cynomolgus, 223.
Macroglossa
bombyliformis, 87.
Macropus
major, 434, 436, 437, 438, 440.
Macropygia
tenuirostris, 225.
Mactra
edulis, 323.
Madopa
flavomacula, 555.
salicalis, 555.
Magascolex
(Perichæta) *antarctica*, 380.
Malacorhinus
undecimpunctatus, 286.
Malacosoma
encausticum, 292.
olivaceum, 292.
Mamestra
adjuncta, 486.
advena, 486.
aliena, 487.
biguttata, 491.
brassicæ, 486.
cuneata, 486, 571.
persicariæ, 487.
—, var. *unicolor*, 487.
Manatus
australis, 160.

Manis
sp., 223.
Maranatha
straminea, 570.
Maretia
planulata, 7.
Margarops
densirostris, 395.
montanus, 326, 395.
— *rufus*, 327.
Marmorina
amphidecta, 570.
obscurata, 570.
Megalaema
leucotis, 357.
Megalomastoma
anostoma, 352.
doriæ, 352.
lowei, 352.
Megapodius
cumingi, 226.
Megascelis
amabilis, 266.
herbacea, 266.
naturalis, 266.
vittata, 266.
Megasema
triangulum, 496.
Melanargia
galathea, 86.
Melittophagus
cyanostictus, 358.
pusillus, 358.
Meranda
inconspicua, 570.
tristalis, 570.
Merops
cyanostictus, 358.
pusillus, 358.
Merula
celænops, 586.
Mesogona
contracta, 519.
dilatata, 495.
divergens, 519.
exigua, 516.
quadrilinea, 519, 571.
Mesoplectra
lilacina, 566.
Mesotrosta
stigmatula, 493.
Mestleta
lutefascialis, 555.
Methorasa
thwaitesii, 528.
Miana
falsa, 491.
inornata, 492.
segregata, 491.
sulfasciata, 491.
vulnerata, 491.
Micardia
argentata, 535.
pulchra, 535.
Micra
hemirhoda, 521.
Microphysa
stictica, 479.
Micropus
melanocephalus, 226.
Microtus
amphibius, 249.
Micteristes
(Theodosia) *telifer*, 286.
Migoplastis
ceylonica, 402.
hampsoni, 402, 432.
Milionia
butleri, 423.
druceï, 297.
guentheri, 296.
luculenta, 423, 432.
snelleni, 296, 297.
zonea, 296.
Milvago
chimachima, 79.
Mimocichla
ardesiaca, 326.
— *albiventris*, 326, 327.
plumbea, 326.
rubripes, 326.
schistacea, 326.
Miresa
crispa, 400, 432.
propexa, 409.
Miselia
cinerea, 503.
compta, 518.
extensa, 503.
funesta, 503, 571.
oxyacanthæ, 503.
Mixoruis
borneensis, 227.
cagayanensis, 227.
woodi, 226.
Mniocera
cincta, 295.
cinerescens, 295.
Moggridgea
abrahami, 35, 41, 42, 46.
dyeri, 34, 35, 42.
Molops
depilatus, 214.
piliferus, 213.
Moma
confusa, 480, 571.
nivcola, 480.
orion, 479.
tapyx, 480.
Monacanthus
melanoproctes, 242, 246.
monoceros, 242.
peccator, 266.
Monitor
niloticus, 607, 612.
Monoplatus
fulvus, 277.
obliteratus, 277.
Monticola
solitaria, 224.
Mormo
muscivirens, 541.
Motacilla
flava, 224.
lugubris, 394.
melanope, 394.
Mulleripicus
pulverulentus, 226.
Munia
atricapilla, 226.
Muræna
tessellata, 242.
Murænesox
cinereus, 242.
Mus
sp., 223
alticola, 234, 235.
concolor, 235.
coxingi, 234.
decumanus, 234.
edwardsi, 234
ephippium, 235.
fuscipes, 249.
hellwaldi, 234.
infraluteus, 232.
jerdoni, 233, 234.
lepturus, 234.
mueller, 234.
musculus, 248.
musschenbroecki, 235.
nivriventer, 234, 235.
rattus, 233.
sabanus, 233, 234.
Muscicapa
cærulescens, 360.
griseisticta, 224.
Mustela
felina, 198.
lutra, 195.
(Lutra) *canadensis*, 197.
(—) *chilensis*, 198.
(—) *paraguensis*, 197.
Mustelus
manazo, 243.
Mydaus
sp., 223
Myiodestes
dominicanus, 326.

Myiadestes
sanctæ-luciæ, 395.
Myiarchus
tyrannulus, 326, 395.
Myrmecobius
fasciatus, 85.
Mythimna
conigera, 483.
deparca, 498.
divergens, 480, 481.
grandis, 480.
limbata, 481.
placida, 481, 498.
rufipennis, 481.
turca, 481.
Myzanthe
pygmæa, 225.

Nænia
contaminata, 542.
muscosa, 490.
Nais
aurigena, 51.
Napalia
præcox, 498.
Narapa
adamata, 427.
breta, 426.
Naseus
brevirostris, 239
Naucrates
ductor, 240.
Nausinoë
euroalis, 420, 432.
neptis, 421.
Naxia
coreana, 560, 571.
Nebria
himalayica, 212.
Nectarinia
collaris, 366.
kalekreuthi, 366.
kilimensis, 365.
longuemarii, 366.
melanogastra, 356, 364.
reichenowi, 365.
Neobrotica
dimidiaticornis, 285, 286.
inconstans, 285.
pallescens, 285.
variabilis, 286.
(Diabrotica) *oberthuri*, 286.
Neodrilus
monocystis, 377, 380.
Nephelodes
datanidia, 484.
Neritina
schmideliana, 327.
Neuria
dissecta, 486.
retina, 510.
Ninox
scutulata, 226.
Noctua
ænea, 521.
affinis, 515.
algæ, 479.
algira, 546.
aliena, 487.
alni, 477.
amethystina, 534.
anceps, 489.
armigera, 519.
asteris, 538.
atriplicis, 510.
augur, 495.
auricula, 484.
aurifera, 531.
baja, 495.
basilinea, 489.
bigramma, 500.
bimaculosa, 508.
brassicæ, 486.
brunnea, 497.
candidula, 525.
cerago, 517.
chrysitis, 530.
chrysographa, 484.
chryson, 530.
circumflexa, 532.
c-nigrum, 496.
compta, 517.
concha, 531.
congener, 513.
conigera, 483.
conspicua, 520.
corusca, 515.
croceago, 516.
dahlii, 497.
descripta, 497.
dilatata, 495.
dilucida, 541.
dioscoriæ, 544.
dipsacea, 520.
ditrapezium, 496.
domiduca, 514.
egregia, 507.
electa, 550.
emarginata, 529.
erythrostigma, 484.
exigua, 493.
exoleta, 539.
favillacea, 478.
festucæ, 531.
fibrosa, 485.
flammea, 510.
flavago, 485, 517.
floccida, 483.
formosa, 536.
Noctua
fucosa, 490.
fulvago, 516.
fuscula, 526.
gemina, 489.
glyphica, 554.
gothica, 511.
—, var. *singularis*, 496.
gracilis, 512, 516.
hymenea, 551.
impura, 483.
iners, 513.
instabilis, 512.
leucostigma, 485.
libatrix, 505.
lignosa, 486.
ligustri, 476.
limosa, 544.
livida, 540.
logopus, 536.
lucipara, 504.
marginata, 520.
munda, 512.
nebulosa, 508.
ni, 533.
nictitans, 484.
num-atrum 511.
nupta, 549.
obscura, 500.
occulta, 508.
ochracea, 485.
orichalcea, 530.
orion, 479.
ornithopus, 537.
perflua, 540.
persicariæ, 487.
perepicillaris, 494.
pinastri, 488.
piniperda, 510.
plebeja, 508.
plecta, 494.
polygramma, 526.
porphyrea, 509.
posthuma, 551.
præceps, 498.
præcox, 498.
prasina, 507.
protea, 506.
psi, 474, 475.
pteridia, 536.
purpureofasciata, 536.
putris, 486.
pyralina, 515.
pyramidea, 539.
pyramidina, 540.
rarida, 500.
remissa, 489.
retusa, 516.
rhizolitha, 537.
rubiginea, 517.
rumicis, 477.

Noctua
rutilago, 520.
saga, 518.
satura, 509.
scolopacina, 487.
scotophila, 540.
scutosa, 520.
segetis, 499.
segetum, 499.
sepii, 493.
sigma, 496.
signata, 531.
silago, 517.
spadicea, 514.
sparganii, 484.
spiralis, 545.
stabilis, 513.
strigosa, 478.
stupens, 494.
stuposa, 546.
submissa, 489.
suffusa, 499.
sulphurea, 528.
suspecta, 513.
tarda, 495, 571.
tigerina, 517.
trabeata, 528.
trapezina, 515.
triangularis, 546.
triangulum, 496.
tridens, 475.
triplasia, 534.
tristigma, 496.
turca, 481.
umbra, 520.
umbrago, 520.
umbrosa, 495.
unca, 522.
unxia, 518.
vaccinii, 514.
—, var. *mixta*, 514.
vespertilio, 545.
vindelicia, 484.
Nodaria
amurensis, 566.
Nonagria
innocens, 483.
sparganii, 484.
turpis, 484.
Nosophora
chironalis, 420.
lymphatalis, 420, 432.
Notauges
fischeri, 368.
Notioptera
dolosa, 401.
properta, 400, 432.
Numenius
lineatus, 225.
variegatus, 225.
Numida
pucherani, 371.
vulturina, 371.
Nutria
felina, 198, 200.
Nyctiardea
violacea, 326, 395.
Nycticorax
crassirostris, 586.
Nyctipao
crepuscularis, 544.
ephesphoris, 544.
latitia, 544.
Nyroca
leucophthalma, 325.

Ochria
flavago, 485.
fortis, 485.
ochracea, 485.
Ochropleura
costalis, 412.
ignota, 411.
musiva, 494.
plecta, 494.
plumbata, 496.
stentzi, 494.
stupenda, 494.
triangularis, 494.
Odontaspis
americanus, 243.
Œdicnemus
capensis, 371.
magnirostris, 225.
Œdionychis
dipus, 276.
graphica, 276.
hondurensis, 276.
humeralis, 276.
proxima, 276.
Œstrelata
hypoleuca, 586.
Olybama
japonica, 569.
Omiza
miliaria, 425.
pachiaria, 425.
Omototus
albomaculatus, 278.
bituberculatus, 278.
carinatus, 277, 278.
fuscatus, 278.
Omphalotropsis
bankaensis, 355.
carinata, 354.
glabrata, 354.
paladilhi, 354.
radiata, 354.
Onus
reinhardti, 27.
Oodes
(Simous) *borneensis*, 384.
Ophiactis
savignii, 7.
Ophichthys
cancrivorus, 242.
cirrhochilus, 242.
Ophideres
fullonica, 544.
tyrannus, 544.
Ophioglypha
kinbergi, 7.
Ophiopeza
conjungens, 7.
Ophiothrix
aspidota, 7.
Ophiusa
algira, 546.
—, var. *curvata*, 546, 571.
arctotænia, 546.
arcuata, 547.
dulcis, 547.
elegans, 548.
falcata, 546.
joviana, 547.
limosa, 544.
mirabilis, 414.
triangulata, 414, 432.
Opigera
arenosa, 498.
cecilia, 498.
Opisthocomus
cristatus, 57, 183.
Opisthoporus
biciliatus, 341.
birostris, 341.
euryomphalus, 341.
latistrigus, 341.
pertusus, 341.
pterocycloides, 341, 355.
rostellatus, 341.
Opisthostoma
decrespignyi, 350.
grandi-spinosum, 349, 350.
Oporina
castaneo-fasciata, 517.
croceago, 516.
Orassia
alliciens, 529.
emarginata, 529.
Oreaster
mammillatus, 6.
Oreochromis
hunteri, 70.
Oresia
tentans, 529.
Oriolus
brachyrhynchus, 368.
chinensis, 228.

Oriolus
notatus, 368.
palawanensis, 225.
xanthonotus, 226.
Orthetrum
albistyla, 298.
camarense, 297, 298.
Orthogonia
crispina, 541.
sera, 541.
Orthorhynchus
exilis, 326.
Orthosia
fausta, 513, 571.
gracilis, 512.
lizetta, 514.
munda, 512.
suspecta, 513.
Orthotomus
ruficeps, 226.
Osphranter
erubescens, 434, 435, 439, 440.
Othreis
fullonica, 544.
Otis
maculipennis, 371.
Otocorys
bilopha, 26.
Otolithus
crassus, 204, 206.
Oxycerca
everetti, 225.
Ozarba
punctigera, 528.

Pachybrachys
reticulatus, 266.
Pachylomerus
natalensis, 34, 35, 46.
Pachyprora
capensis, 360.
mixta, 356, 359.
molitor, 359, 360.
Pachyrhynchus
gosseleti, 66.
Pagellus
affinis, 245.
Pagrus
ruber, 245.
spinifer, 245.
Palaina
patula, 114.
Palinurus
vulgaris, 394.
Pandesma
juhra, 413, 432.
quenavadi, 413, 414.
virens, 480.
Pandion
haliaetus, 225.
Pangora
distorta, 403, 404.
rubelliana, 402.
Pangrapta
flavomacula, 567, 568.
incisa, 568.
Panolis
flammea, 511.
piniperda, 510, 511.
Papilio
ajax, 86.
asterias, 86.
cresphontes, 86.
machaon, 86.
podalirius, 86.
troilus, 86.
turnus, 86.
Paracolax
barbalis, 561.
Paradoxurus
philippensis, 223.
Parasa
fumosa, 408, 432.
lepida, 408.
Parocolax
grisealis, 561.
nemoralis, 561.
Parus
amabilis, 225.
cæruleus, 186.
elegans, 224.
Paxillus
adversus, 348.
beccarii, 348.
rubicundus, 348.
Pechipogon
barbalis, 561.
Pedetes
caffer, 220.
capensis, 260, 262.
Pelamia
electaria, 554.
Pelamys
orientalis, 240.
Pelargopsis
gouldi, 225.
Pelichnibothrium
speciosum, 324, 325.
Pempheris
molucca, 239.
Penicillaria
costalis, 536.
guyra, 536.
Pennula
millsi, 5.
Perdix
cinerea, 394.
Perichæta
antarctica, 380.
intermedia, 380.
Pericrocotus
cinereus, 224.
igneus, 226.
Perideris
auripigmentum, 579.
Perigea
argyrosticta, 492.
centralis, 492.
dolorosa, 492.
galaxia, 492.
gemella, 492, 571.
illecta, 492.
leucospila, 492.
serva, 492.
Perinæmia
lignosa, 541.
Peristera
tympanistria, 369.
Pernis
ptilonorhynchus, 225.
Phacellodomus
ruber, 33.
rufipennis, 33.
striaticollis, 33.
Phalæna
auricula, 484.
c-aureum, 531.
chrysitina, 531.
crepuscularis, 544.
nemoralis, 561.
polyodon, 494.
pomona, 544.
unca, 522.
viridaria, 521.
(Attacus) *crepuscularis*, 544.
(Geometra) *barbalis*, 561.
(Noctua) *atriplicis*, 510.
(—) *affinis*, 515.
(—) *achatina*, 546.
(—) *archesia*, 552.
(—) *algira*, 546.
(—) *alni*, 477.
(—) *brassicæ*, 486.
(—) *chrysitis*, 530.
(—) *c-nigrum*, 496.
(—) *dipsaceus*, 520.
(—) *exoleta*, 539.
(—) *festucæ*, 531.
(—) *fullonica*, 544.
(—) *fulvago*, 517.
(—) *glyphica*, 554.
(—) *gothica*, 511.
(—) *leporina*, 477.
(—) *libatrix*, 505.
(—) *lucipara*, 504.
(—) *morpheus*, 493.
(—) *nupta*, 549.
(—) *occulta*, 508.

Phalæna
(Noctua) *paranympha*, 552.
(—) *persicariæ*, 487.
(—) *perspicillaris*, 494.
(—) *pinastri*, 488.
(—) *plecta*, 494.
(—) *præcox*, 498.
(—) *psi*, 475.
(—) *puera*, 518.
(—) *putris*, 486.
(—) *pyramidea*, 539.
(—) *retorta*, 545.
(—) *retusa*, 516.
(—) *rumicis*, 477.
(—) *scabriuscula*, 488.
(—) *sulphuralis*, 528.
(—) *trapezina*, 515.
(—) *triplasia*, 534.
(—) *turca*, 481.
(—) *uncula*, 522.
(—) *vaccinii*, 514.
(—) *virbia*, 553.
(Tortrix) *fasciata*, 526.
(—) *unca*, 522.
Phalanger
orientalis, 161.
Pharetra
leucoptera, 478.
longa, 478.
rumicis, 477.
Phasianus
chrysomelas, 247.
Philydor
cervicalis, 33.
erythrocercus, 33.
Phineca
basistriga, 407.
canities, 407.
Phlogophora
beatrix, 503.
lucipara, 504.
pallens, 503.
Phoca
vitulina, 321, 323.
Pholidauges
fischeri, 356, 368.
Phonipara
bicolor, 326, 395.
Phreoryctes
smithi, 381.
Phyletis
borealis, 427, 432.
meonaria, 427.
Phyllium
gelonus, 262, 263.
Phyllobothrium
crispatissimum, 324, 325.
Phyllobothrium
lactuca, 324.
tridax, 324.
Phyllophila
cretacea, 521.
obliterata, 520.
wimmerii, 520, 521.
Phylloscopus
borealis, 224.
Physa
aliciæ, 139, 140, 142.
badia, 136.
beddomei, 136.
bonus henricus, 136.
breviculmen, 136.
carinata, 136.
concinna, 136.
cumingii, 136.
dispar, 136.
fusiformis, 136.
gibbosa, 136, 138.
kainesii, 137.
latilabiata, 137.
multistrigata, 139, 140.
newcombi, 137.
obesa, 136.
pectorosa, 136.
physopsis, 139, 140.
producta, 136.
proteus, 136, 138, 139.
pyramidata, 136.
reevei, 136.
scalaris, 139, 140.
sinuata, 139, 140.
tabulata, 139, 140.
tasmanica, 137.
texturata, 136.
truncata, 136.
vestita, 138.
Physimerus
simoni, 278, 279.
variegatus, 279.
Phytometra
ænea, 521.
Piada
multiplicans, 538.
—, var. *japonica*, 538, 571.
Piaya
cayana, 169, 187.
Picolaptes
affinis, 34.
parvirostris, 33.
Picus
nubicus, 356.
Pinarochroa
hypospodia, 356, 364.
Pinicola
enucleator, 306.
Pitta
atricapilla, 225.
Pitta
erythrogastra, 225.
propinqua, 225.
Placodes
amethystina, 534.
spencei, 534.
Plagiodera
ornata, 268.
Plagyodus
ferox, 322.
Planorbis
corneus, 139, 140.
Plastemis
retusa, 516.
Plataplecta
pruinosa, 476.
soluta, 476.
subviridis, 478.
Platydactylus
albomaculatus, 143.
burmeisteri, 143.
deissneri, 143.
Platydia
casta, 535.
compressipalpis, 535.
Platyglossus
marginatus, 240.
Platyja
subiferalis, 554.
Platystethus
sp. inc., 157.
abbreviatus, 158.
cultratus, 157.
quentheri, 157.
suttoni, 158.
Plectostoma
decrespignyi, 350.
Plectropterus
gambensis, 371.
Plesiophysa
striata, 141.
Plexaura
imperialis, 47.
principalis, 47, 49.
suffruticosa, 47, 48, 49.
vermiculata, 49.
Plexaurella
affinis, 48, 49.
anguiculoides, 48, 49.
anguiculus, 48.
dichotoma, 48.
porosa, 49.
vermiculata, 48, 49.
Ploceus
aureoflavus, 367.
Plusia
agramma, 530.
albostriata, 532.
amethystina, 534.
aurifera, 531.
bractea, 530.

Plusia
c-aureum, 531, 532.
chalcitis, 531.
cheiranthi, 533.
chrysitina, 531.
chrysitis, 530.
chryson, 530.
concha, 531.
eugenia, 533.
excelsa, 530.
festucæ, 531.
gamma, 532.
gemmifera, 480.
gutta, 532.
humeralis, 530.
jessica, 532.
lemina, 530.
loculos, 533.
metabractea, 530.
mikadina, 532.
nadeja, 530.
ni, 533.
nigrisigna, 532.
ochrata, 533.
ornatissima, 533.
purissima, 533.
pyropia, 533.
rutilifrons, 533.
serena, 532.
signata, 531.
typinota, 532.
verticillata, 531.
virgo, 534.
zosima, 531.
Plusidia
abrostoloides, 533.
Plusiodonta
auripicta, 535.
Poaphila
mollis, 522.
Podargus
humeralis, 179.
Podocerapsis
palmatus, 452.
Podocerus
cumbrensis, 452.
Pœcilonetta
erythrorhyncha, 371.
Pogonorhynchus
melanopterus, 356.
stigmatothorax, 357.
Polia
atriplicis, 510.
herbida, 508.
nebulosa, 508.
occulta, 508.
soluta, 476.
Poliospiza
striolatus, 367.
Polyboroides
radiatus, 77.
Polyboroides
typicus, 78, 79, 82.
Polydesma
vulgaris, 490.
Polypedates
biscutiger, 28, 31.
cruciger, 27, 31.
leucomystax, 29, 31.
maculatus, 27, 28, 29, 31.
megacephalus, 29.
quadrilineatus, 29.
rugosus, 29.
scutiger, 27.
Polyphasmis
pulcherrima, 501, 502.
Polyplectron
napoleonis, 226.
Pomatomus
telescopium, 236, 238.
Pompelon
marginata, 401.
valentula, 401.
Pontia
freyeri, 293.
suasa, 293.
Prasos
mariana, 294, 297.
Pratincola
axillaris, 363.
Prigenia
viridiaurata, 385.
vollenhoveni, 386.
Prioniturus
cyaniceps, 225.
Prionochilus
johannæ, 226.
Prionops
talacoma, 361.
Pristis
pectinatus, 243.
Pristodactyla
agonoides, 218.
lacerans, 214.
Pristonychus
kashmirensis, 214.
Prodenia
littoralis, 510.
retina, 510.
Promerops
minor, 358.
Prosicela
chevrolatii, 267.
Prothymia
ænea, 521.
viridaria, 521.
Protopterus
annectens, 147, 148.
Protosticta
gracilis, 298, 302.
simplicinervis, 302.
Psalidoprocne
antinorii, 359.
petiti, 359.
Psammosaurus
griseus, 172.
Pseudogomphus
insignis, 297, 299.
Pseudoscarus
cyanognathus, 240.
ghobban, 240.
troschelii, 240.
Psimada
cinerascea, 554.
Pternistes
humboldti, 370.
infuscatus, 370.
leucoparæus, 370.
nudicollis, 370.
Pterocles
decoratus, 369.
exustus, 370.
gutturalis, 370.
Pterocyclos
anomalus, 339, 341.
biciliatus, 341.
cucullus, 340, 355.
endædaleus, 339, 340.
euryomphalus, 341.
labuanensis, 339.
lowianus, 339, 340.
mindaiensis, 340.
niahensis, 340, 355.
planorbulus, 341.
rostellatus, 341.
sumatranus, 339.
tenuilabiatus, 339, 344, 355.
Pterogon
clarkiæ, 86.
Pterois
antennata, 239.
Pteromys
nitidus, 230.
Pteronura
sambachii, 197.
Pteropus
hypomelanus, 223.
Pterothysanus
atratus, 402.
laticilia, 402.
noblei, 401, 432.
Ptilocichla
falcata, 226.
Ptilopus
lechlancheri, 225.
melanocephalus, 225.
Ptychosinguu
orientale, 574.
Pupina
doriæ, 351, 355.
evansi, 351, 355.

Pupina
hosei, 351, 355.
Pupinella
borneensis, 352.
Putorius
sarmaticus, 85.
Pycnonotus
cinereifrons, 226.
layardi, 363.
Pygæra
bucephala, 87.
Pyralis
achatalis, 556.
crassalis, 558.
derivalis, 562.
dulciculalis, 418, 419.
griscalis, 561.
formosissimalis, 536.
pectitalis, 561.
platymitris, 418, 419.
rostralis, 558.
salicalis, 555.
sericealis, 561.
tarsicrinalis, 562.
terriculalis, 556.
trabealis, 528.
Python
breitensteini, 433.
curtus, 393, 432, 333.

Querquedula
erythrorhyncha, 371.
Quiscalus
inflexirostris, 395.

Radinavia
palpalis, 493.
Raja
nasuta, 321.
Rallina
fasciata, 225.
Rallus
obscurus, 5.
Ramphocorys
clot-beyi, 26.
Rana
temporaria, 145, 146.
Raphia
fasciata, 491.
Raphaulus
bombycinus, 350.
pfeifferi, 351.
Remigia
annetta, 553.
archesia, 552, 553.
nigrisigna, 553, 571.
Renodes
hamada, 564.
usuriensis, 553.

Rhacophorus
cruciger, 28, 30. 31, 32.
equs, 32.
leucomystax, 27, 28, 29.
maculatus, 27, 28, 29, 30, 31, 32.
quadrilineatus, 27, 30.
rugosus, 27.
sexvirgatus, 27, 30.
Rhamphocinclus
brachyurus, 395.
Rheithrosciurus
macrotis, 232.
Rhinobatus
halavi, 243.
schlegeli, 236, 243.
Rhinoceros
bicornis, 448.
lasiotis, 9.
sondaicus, 9, 10, 255, 257, 258.
sumatrensis, 7, 8, 9, 11, 12, 13, 15, 19, 20, 21, 23, 24, 258.
unicornis, 258.
Rhinolophus
luctus, 159.
Rhinopomastes
cyanomelas, 358.
Rhiostoma
cavernæ, 342. 355.
quendolenæ, 342, 355.
hungerfordi, 342.
iris, 343.
Rhipidura
nigritorquis, 225.
Rhodaria
amata, 521.
Rhododrilus, nov. gen., 380.
minutus, 381.
Rhodoneura
albatalis, 422, 432.
strigatula, 422.
Rhynchastatus
funebris, 361.
Rhynchina
eremialis, 417.
Rhynchobatus
djeddensis, 243.
Rivula
sericealis, 561.
subrosea, 560.

Salarias
lineatus, 240.
unicolor, 240.
Salmo
fario, 135.
Saltator
guadelupensis, 326.

Samia
cecropia, 86.
Sangaria
haagi, 274.
haroldi, 273, 274.
Sapho
longistigma, 300.
pulchella, 298, 300.
Sarnea
costinotata, 568.
flavomaculata, 567.
indentalis, 567, 571.
subviolacea, 568.
textilis, 567, 571.
trimantesalis, 567.
vasava, 568.
Sarcidiornis
africanus, 371.
Sarcops
calvus, 228.
Saturnia
pyri, 87.
Saurothera
vieilloti, 187.
Scedopla
regalis, 494.
Schematiza
apicalis, 289.
funerea, 287.
unistriata, 287, 288.
venezuelensis, 287.
Sciuropterus
alboniger, 223.
davisoni, 159.
Sciurus
badjing, 231.
bicolor ephippium, 230.
concinnus, 231, 232.
exilis, 231, 232.
jentinki, 230, 231.
melanotis, 232.
notatus, 231.
plantani, 231.
pluto, 230.
prevostii, 230.
steerii, 223.
tenuis, 230, 231.
whiteheadi, 231, 232.
Scleroptera
subtorquata, 370.
Sclerorhynchus
atavus, 449, 450.
Scopelus
scoticus, 27.
Scops
everetti, 225.
fuliginosa, 225.
Scorpæna
cardinalis, 156.
cookii, 151, 155, 156.
cruenta, 156.

Selepa
manleyi, 479, 571.
—, var. *clara*, 479.
Semiphora
gothica, 511.
pallescens, 511.
Semnopithecus
chrysomelas, 159, 160.
femoralis, 159.
hosei, 159, 228.
obscurus, 159.
Serinus
striolatus, 367.
Seriola
dumerilii, 240.
Serpentarius
reptilivorus, 82.
Serranus
altivelis, 244.
brunneus, 244.
coromandelicus, 237.
diacanthus, 237.
fimbriatus, 322, 325.
gibbosus, 244.
gigas, 322.
jayakari, 237.
latifasciatus, 237, 244.
morrhua, 244.
præopercularis, 244.
rogaa, 238.
salmonoides, 237.
sonnerati, 238.
striolatus, 244.
Setophaga
ruticilla, 326, 395.
Silurus
egertoni, 201.
Simena
luctifera, 295.
nigricans, 295.
Simplicia
rectalis, 564.
Siphia
banyumas, 226.
erithacus, 226.
lemprieri, 225.
ramsayi, 225.
Siphonops
annulatus, 604.
Smerinthus
populi, 86.
quercus, 86.
tiliæ, 86.
Somena
abjecta, 405, 432.
scintillans, 405.
Sophrosyne
robertsoni, 452.
Spælotis
lucens, 501.
Spælotis
nitens, 490.
squalida, 501.
Sparnus
minutus, 280.
Spatangus
purpureus, 54.
Spermestes
cucullatus, 367.
Sphagolobus
atratus, 587, 588.
Spheniscus
chrysocome, 84.
Sphinx
ligustri, 86.
quinquemaculata, 86.
pinastri, 86.
Sphyræna
acutipennis, 240.
agam, 240.
Spica, gen. nov., 424.
lutcola, 424, 432.
Spilaretia
punctata, 405.
ummera, 405, 432.
Spilornis
bacha, 226.
Spintherops
dilucida, 541.
Spirama
ægrota, 545.
funestris, 545.
inæqualis, 545.
interlineata, 545.
japonica, 545.
jinchuena, 545.
martha, 545
rectifasciata, 545.
retorta, 545.
simplicior, 545.
suffumosa, 545.
Spizætus
limnaetus, 226.
occipitalis, 79.
philippensis, 225.
Spœlotis
fraterna, 411.
sincera, 411.
Squatarola
helvetica, 225.
Squatina
crassidens, 451.
Steatornis
caripensis, 161, 178, 181, 190.
Stegodyphus
acanthophilus, 44.
gregarius, 34, 42, 46.
Stegostoma
tigrinum, 243.
Stemmatophora
foliata, 418, 432.
vibicalis, 418.
Sterna
bergii, 225.
melanauchen, 225.
Stethojulis
interrupta, 240.
Stomias
ferox, 27.
Strepsiceros
imberbis, 246, 376.
Strepsilas
interpres, 225.
Strix
aluco, 172.
flammea, 177, 178.
(Ketupa) *ceylonensis*, 168.
Sturnia
violacea, 224.
Stylochus
pelagicus, 55.
Stylorhiza
(Phyllorhiza) *punctata*, 585.
Sudis
hyalina, 241.
jayakari, 241.
ringens, 241.
Suratha
albirenalis, 423.
eremialis, 422.
Surniculus
lugubris, 226.
Sus
sp., 223.
Syllexis
lucida, 296.
Synagris
isacanthus, 238.
Synclera
multilinealis, 421.
nemoralis, 421, 432.
Synodontis
guttatus, 71.
punctulatus, 71.
serratus, 71.
Syntomis
pfeifferi, 400.
wimberleyi, 400, 432.
Sypna
achatina, 542.
astrigera, 542.
fuliginosa, 542.
fumosana, 542.
hercules, 543.
moorei, 542.
picta, 542.
Syrnium
whiteheadi, 226.

Syrrhaptes
paradoxus, 184.
Syrrhoë
fimbriata, 452.
Systena
s-littera, 272.

Tænia
bifaria, 325.
calva, 324, 325.
falciformis, 324, 325.
magellanica, 325.
sulciceps, 324.
Tæniocampa
auroriæ, 513.
carnipennis, 511.
ella, 512.
evanida, 512, 513.
gothica, 511.
gracilis, 512.
instabilis, 512.
munda, 512.
—, var. *immaculata*, 512.
odiosa, 513.
stabilis, 513.
Tæniodera
ditissima, 390.
Tanygnathus
luzoniensis, 225.
Taonius
hyperboreus, 128.
pavo, 128.
Tapirus
americanus, 10.
indicus, 255, 257, 258.
terrestris, 254, 256, 257.
Tarsiger
orientalis, 356, 361.
Tatocnemis
malgassica, 297, 298, 301, 302.
Tejus
teguexim, 465, 466.
Telea
polyphemus, 86.
promethea, 86.
Telephorus
sp. nov., 111.
bieti, 101, 102, 111.
brahminicus, 98.
chalybeipennis, 96, 111.
cœlestis, 104, 105, 111.
cruralis, 98.
erythropterus, 361.
flavicornis, 108.
huddi, 100.
Telephorus
imperialis, 102, 103, 104, 111.
insularis, 101, 111.
khasianus, 97, 111.
kiukianganus, 107.
leechianus, 104.
—, var. *æneipennis*, 104.
lividus, 106.
manducatus, 100.
metallescens, 107.
nepalensis, 97.
nicobarinus, 101.
nobilis, 103, 111.
oberthueri, 102.
orientalis, 106.
purpureipennis, 107, 111.
regalis, 103.
semifulvus, 100.
seminustus, 99.
senegalensis, 361.
sinensis, 106, 107.
stygianus, 99.
thibetanus, 102.
versicolor, 97.
viator, 98.
violaceipennis, 105.
viridipennis, 97, 104.
(Ancistronycha) *bartoni*, 106.
(—) *orientalis*, 105.
(—) *prattianus*, 105, 111.
Temnopleurus
torcumaticus, 7.
Teniocampa
tabida, 495.
Terekia
cinerea, 225.
Terpsiphone
cristata, 360.
ferreti, 360.
melanogastra, 361.
Tethea
retusa, 516.
Tetrabothrium
macrocephalum, 324.
torulosum, 324.
Tetraroge
guentheri, 239, 246.
Tetrodon
margaritatus, 242.
valentini, 242.
Textor
dinemelli, 368.
Thais
polyxena, 86.
Thalpochares
adulans, 521.
Thalpophila
cytherea, 475.
digna, 475.
Thaluranis
wagleri, 326, 327.
Thaumalea
picta, 135.
Therates
princeps, 383.
punctipennis, 383.
schaumi, 383.
spectabilis, 383.
whiteheadi, 383.
Theriodesmus
phylarchus, 259, 261, 262.
Thosea
lasa, 408.
rara, 408, 432.
Thriponax
harvitti, 226.
Thripophaga
fusciceps, 33.
Thryothorus
mesoleucus, 395.
rufescens, 326.
Thyone
sacellus, 7.
Thyridospila
sphæriphora, 415.
virgata, 415.
Tiga
everetti, 226.
Tinnunculus
alaudarius, 262.
caribbearum, 326.
Tinolius
eburneigutta, 405.
hypsana, 405.
Tiridata
colligata, 505.
Torpedo
fairchildi, 321.
marmorata, 243.
Torresia
australis, 158.
Totanus
brevipes, 225.
calidris, 225.
glareola, 225.
Toxocampa
enormis, 543.
lilacina, 543.
limosa, 544.
maxima, 543.
recta, 543.
vulcanea, 543.
Trachea
atriplicis, 510.
piniperda, 511.

Trachyphonus
arnaudi, 357.
boehmi, 357.
erythrocephalus, 357.
margaritatus, 357.
squamiceps, 357.
Tragelaphus
decula, 220.
gratus, 220.
Tragulus
javanicus, 223.
Treron
nasica, 226.
nudirostris, 369.
vernans, 225.
wakefieldi, 369.
Triæna
anædina, 476.
Trichiurus
haumela, 239.
Tricholæma
stigmatothorax, 357.
Trichys
guentheri, 235.
lipura, 75, 76, 235, 236.
Tricondyla
beccarii, 383.
Trigla
arabica, 245, 246.
capensis, 236, 240.
polysticta, 245, 246.
Triglops
murrayi, 27.
Tringa
ruficollis, 225.
subminuta, 225.
Tringoides
hypoleucus, 225.
Triphæna
jankowskii, 502.
semiherbida, 502.
Triphænopsis
cinerescens, 502.
efflorescens, 502.
lucilla, 502.
Triplatoma
cypræa, 614.
gestroi, 613.
varia, 613, 620.
Triplax
vittipennis, 614, 620.
Trochomorpha
godeti, 578, 582.
Tropidonotus
natrix, 609.
Trotosema
sordidum, 554.

Truncatella
aurantia, 354.
marginata, 354.
Tubifex
riculorum, 381.
Tupaia
ferruginea, 223, 229.
javanica, 223.
Tupinambis
nigropunctatus, 465.
teguexin, 465, 466, 474, 604.
Turacus
hartlaubi, 358.
Turdinus
rufifrons, 226.
Turdus
tephronotus, 363.
Turnix
nigrescens, 224, 225.
raynaldi, 224.
Turtur
dussumieri, 225.
lugens, 369.
semitorquatus, 369.
tigrina, 226.
Tylognathus
montanus, 71.
Tympanistria
tympanistria, 369.
Tyrannus
rostratus, 326.

Umbrina
sinuata, 245.
striata, 245.
Upeneus
pleurotænia, 239.
Upucerthia
bridgesi, 32.
montana, 32.
Uria
troile, 170.
Urogymnus
asperrimus, 243.
Uromys
cervinipes, 248.
Urostrophus
scapulatus, 144, 145.
torquatus, 145.
Urothoë
lachnecesa, 394.

Vanellus
speciosus, 372.
Vanessa
antiopa, 86, 87.
atalanta, 86.
cardui, 86.
io, 86.
levana, 86.
Vanessa
polychlorus, 86.
Varanus
griseus, 605.
indicus, 605.
nigropunctatus, 605.
niloticus, 605.
Vidua
fischeri, 367.
hypocherina, 367.
splendens, 367.
Vireosylvia
calidris, 326.
Virgularia
mirabilis, 394.
Viverra
aterrima, 198, 199.

Xanthia
cerago, 517.
flavostigma, 482.
fulvago, 517.
silago, 517.
Xanthodes
intersepta, 518.
migrator, 518.
transversa, 518.
Xenocichla
albigularis, 363
nigriceps, 356, 362.
placida, 356, 363.
tephrolæma, 362.
Xenoloba, nov. gen., 387.
speciosa, 387.
Xeromys
myoides, 248, 250.
Xylina
exoleta, 539.
fureifera, 537.
ingrica, 537.
ornithopus, 537.
perspicillaris, 494.
pinastri, 488.
pruinosa, 537.
putris, 486.
rhizolitha, 537.
saxea, 537, 571.
scolopacina, 487.
Xylomeges
bella, 510.
Xylophasia
alopecurus, 488.
canquenensis, 487.
combusta, 488.
commixta, 488.
flavostigma, 488.
funerea, 487.
incognita, 487.
lithoxylea, 487.
rurea, 488.
scitula, 488.

Xylophasia
scolopacina, 487.
sodalis, 487, 488.
tychoona, 488, 571.

Ypthima
ceylonica, 396.
huebneri, 396.
jocularia, 396.

Zanclognatha
assimilis, 562.
Zanclognatha
fumosa, 562.
griscalis, 561.
linealis, 562.
stramentacealis, 562.
tarsicrinalis, 562.
tarsipennalis, 562.
trilinealis, 561.
Zenaida
martinicana, 326.
Zeocephus
cyanescens, 225.
Zethes
musculus, 554.
Zonopterus
magnificus, 391.
Zonora, nov. gen., 419.
concatenalis, 419.
opiparalis, 419, 432.
Zosterops
perspicillata, 356, 366.
Zygæna
malleus, 243.

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